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# NORTHERN FOXE BASIN

an area economic survey

1965

by:

G. ANDERS.



Canada

INDUSTRIAL DIVISION    NORTHERN ADMINISTRATION BRANCH  
DEPARTMENT OF NORTHERN AFFAIRS & NATIONAL RESOURCES



1101051



### PREFACE

This report is another of a series of Area Economic Surveys carried out by the Industrial Division of the Department of Northern Affairs and National Resources.

These surveys are a continuing part of the Department's efforts to determine the basis for local economic and social progress in the northern areas. Basically, the surveys are intended to:

- (1) Assess the renewable resources as to their ability to sustain the local population.
- (2) Determine the degree of exploitation of these resources and the efficiency of their use.
- (3) Investigate and explain the social and economic factors affecting resource utilization.
- (4) Recommend ways and means whereby the standard of living of the local people might be improved.

As the reasons for these surveys are practical, the material presented in the reports is selected for its relevance in this respect; much academic material gathered in the course of the investigation which may have been taken into account in the deliberations is necessarily excluded from the reports.

The report is published in its present form primarily for use within the Department, for distribution to other interested government agencies, and for limited distribution to universities and organizations and individuals actively interested in northern affairs.

The opinions expressed in this report are those of the author and not necessarily those of the Department of Northern Affairs and National Resources.



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## Chapter I

### INTRODUCTION

#### Scope of Survey

The basic purposes of area economic surveys are outlined in the preface. The specific goals of the Hall Beach-Igloolik survey were:

- 1) To study the economic situation and potential of the area hunted over by the people living at or trading into Igloolik;
- 2) To assess the degree of utilization of resources;
- 3) To recommend specific programs which might help to improve the standard of living of the local population;
- 4) To comment on the advisability of establishing a new administrative centre at Hall Beach;
- 5) To try to forecast the long-range effects of the possible development at Mary River of a large iron mine on the economy of the area.

#### Boundaries of Survey Area

By these goals the geographic boundaries of the survey area were defined as follows: (See Map #1)

The southern limit on Melville Peninsula is a line from Blake Bay on the southeast coast to Lefroy Bay on the west coast. This is approximately the dividing line between the hunting grounds of the Igloolik and the Repulse Bay Eskimos. The area south of this line was dealt with in the Southampton Island Survey report of September 1962 by D.M. Brack.

The western boundary of the survey area is in its southern part the west coast of Melville Peninsula, heading in its northern part further west to follow the eastern shore of the Gulf of Boothia as far as Bernier Bay so that Crown Prince Frederick Island is included.

To the north the dividing line between the Igloolik and Arctic Bay and Pond Inlet trading and hunting areas is roughly an area extending from the head of Bernier Bay, along the upper part of the Gifford River to the head of Steensby Inlet. The operations of Baffinland Iron Mines Limited were included as being likely to become the predominant factor in the economy of the area. Therefore, the survey area would include north of the Igloolik/Arctic Bay - Pond Inlet divide, the triangle between Taser Lake, Milne Inlet - and the lakes on the middle reaches of the Rowley River.

From there the eastern limit is an arc stretching in a south-easterly



direction towards Flint Lake - Piling Bay and continuing in a straight line across Foxe Basin towards Blake Bay.

The survey thus covers an area of approximately 300 miles by 300 miles. It extends over the following map sheets: National Topographic Series - 8 miles to the inch - Bernier Bay, Cockburn Land, Melville North, Foxe Basin North, Melville South and Foxe Basin South; and on World Aeronautical Charts - 16 miles to the inch - Lancaster Sound, Eclipse Sound, Murchison River, Rowley River, Quoich River and Koukdjuak River.

### Field Work

The field work for the survey was carried out by the author and Mr. K. Crowe between May 24 and August 18, 1965. From Igloolik as a base, trips were made by dog team and canoe to Agu Bay, Parry Bay and Jens Munk Island. Early in August, the base was shifted to Hall Beach. A series of flights were made by float equipped Otter to visit areas not reached previously and to carry out wildlife counts and to do a limited amount of test fishing. Approximately 600 miles were travelled by dog team, 300 by canoe and 4,000 by plane (Map 1).

### Acknowledgements

Many people and organizations contributed in various ways to the success of this survey. Special recognition is due to the part played by Mr. Keith Crowe, seconded by the Administrator of the Arctic to the survey for the field work. His knowledge of the Eskimo language and of Arctic conditions in general greatly facilitated the collection of data and information. His comments were always stimulating and to the point.

The co-operation and assistance of the following are gratefully recognized:

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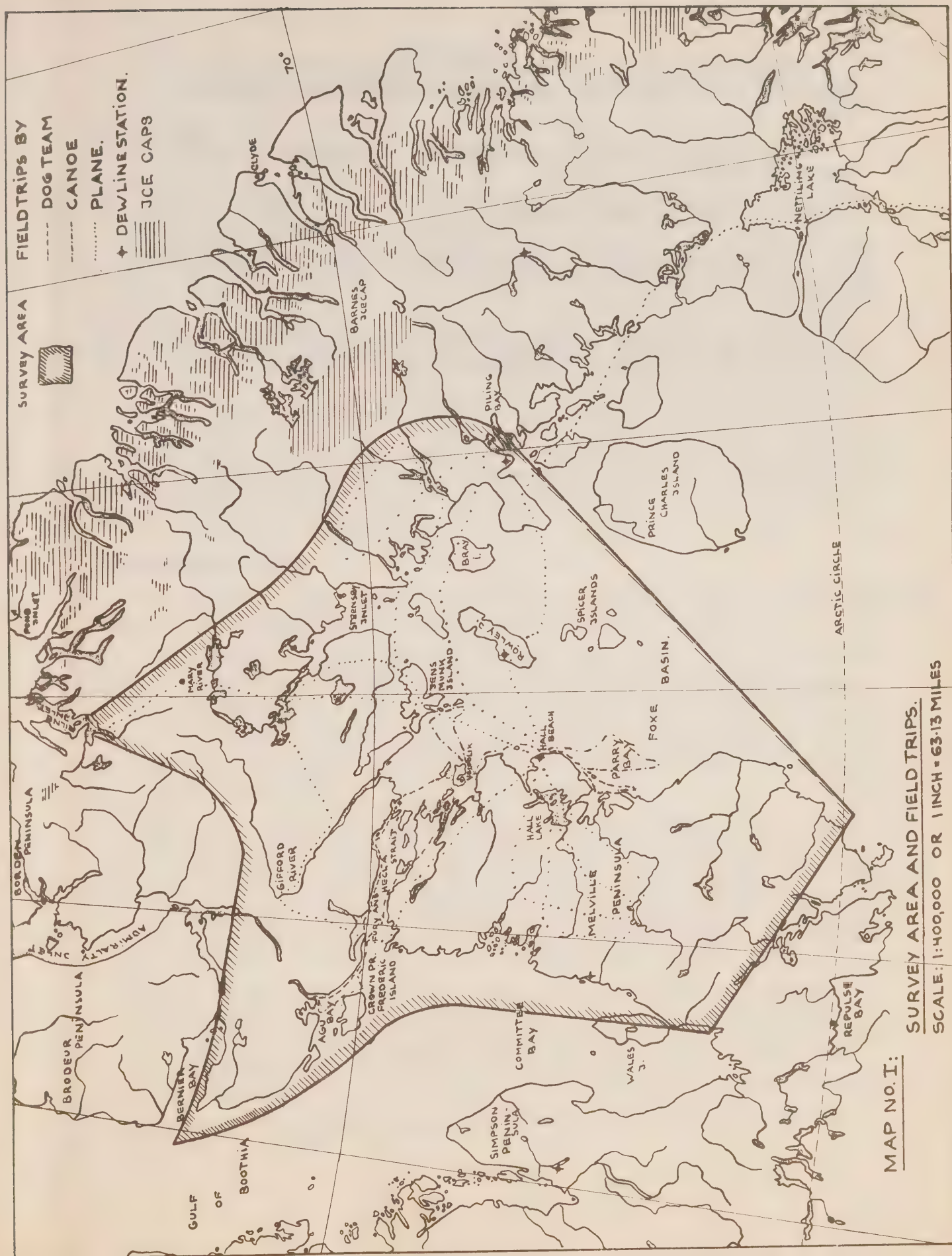
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R.C.M.P. Constable B. Donahue at Igloolik and Sgt. Fry and Cpl. Backus of the R.C.M.P. at Frobisher Bay.



MAP NO. I.:

## SURVEY AREA AND FIELD TRIPS.

SCALE: 1:400,000 OR 1 INCH = 63.13 MILES



Messrs. L. Hoban and A. Cronk of the regional office of the Department of Northern Affairs and National Resources at Frobisher Bay.

Mr. J. Haining, the Area Administrator at Igloolik and his staff, Messrs. W. Buske and H. Bartels.

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Thanks are due also to the Northern Co-ordination and Research Centre for the production and distribution of this report.

## Chapter II

### PHYSICAL GEOGRAPHY

#### Physiography

##### General

Melville Peninsula constitutes the most northerly mainland projection of the Canadian Shield. It consists basically of a large plateau with absolute altitudes of about 1,000' and local relief of 200' to 300', flanked by narrow limestone lowlands which are somewhat more extensive in the north than in the south. The bedrock lies exposed over large areas of the plateau surface. The overburden in the west and north consists largely of a thin layer of till while in the east shattered rock fields predominate. Escarpments, boulder fields and deep valleys make it difficult to cross the peninsula by land. Most of the coastal areas surrounding Foxe Basin and the islands in it are flat plains with low relief covered with weathered shingle which usually supports only thin vegetation. However, the slopes of Fury and Hecla Strait, Siorarsuk Peninsula, part of Jens Munk Island and of some smaller bays and inlets of north-eastern Foxe Basin rise in places quite steeply from the sea. On Baffin Island the terrain again becomes more rugged the further one moves away from Foxe Basin and its northern and north-eastern slopes are cut up into steep, winding fiords.

##### Physiographic Regions

In detail, the area may be subdivided into a larger number of physiographic regions. The numbers corresponding to those shown on Map No. 2. \*

- 1) The Lyon Plateau: The Lyon Plateau is a rugged, slightly dissected upland rising sharply from Lyon Inlet. The highest elevations of up to 1,000' occur adjacent to the Inlet and consist almost entirely of bare outcrops. The land becomes lower towards the southwest and more ground moraine occurs in this direction. Material washed down in this way forms numerous beach ridges and low terraces.
- 2) The Aua Lowland: This is almost and in some areas absolutely flat, broken in places by low ridges extending out to sea to form the headlands. The lowland is drained by a number of almost parallel streams of which the Aua River is the largest. The surface consists of bare rock and partly sorted ground moraine. Maximum relief does not exceed 100' and the maximum altitudes are estimated at 400'. The valleys are shallow and often marshy in summer.
- 3) The Prince Albert Plateau: The plateau rises from the coastal plain of Committee Bay steeply, almost unbroken to about 1,000' and is divided into a northern and southern part by the Garry Hills. The gently rolling upland surface is either bare or covered by a

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\* Details of physiographic region after Rand Reports RM - 2837 - PR and RM - 2706 - I - RR.

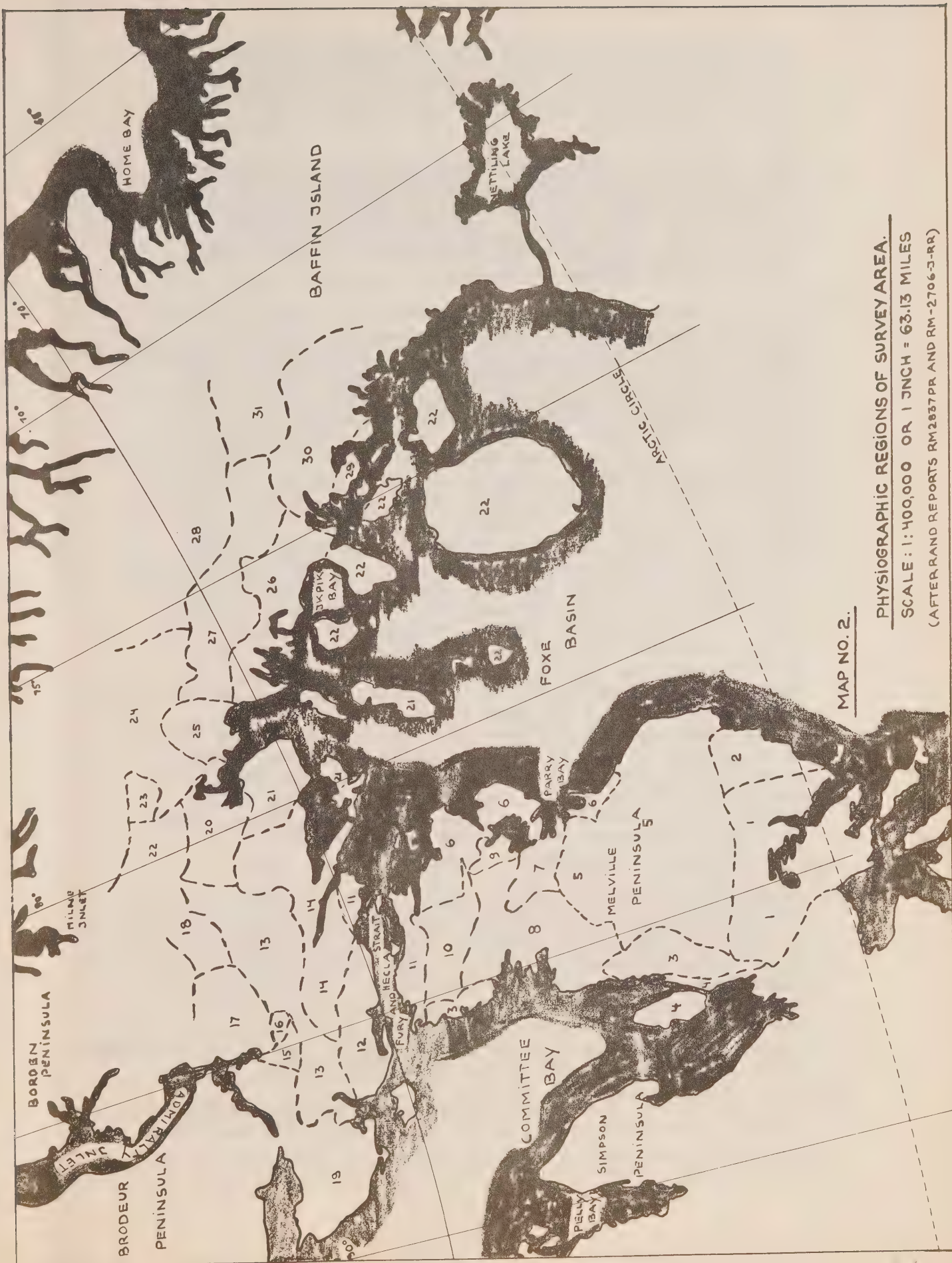




Figure No. 2: Coastal Flats Between Hall Beach and Igloolik

Figure No. 3: Approaching Hall Beach by Air







thin layer of frost-shattered rock. Streams flow west in deeply incised valleys. In the northern part, the lower valleys contain quantities of silt and there are fewer outcrops in the uplands.

- 4) Wales Island and Coast of Melville: These consist of flat lowlands that have developed on limestone. The coastal strip is rarely more than  $2\frac{1}{2}$  miles wide with maximum elevations of 50' and 75' on Wales Island. The cover consists mainly of fine silts and fine sands and the surface is often marshy with many large shallow lakes.
- 5) Barrow Plateau: The plateau region rises in a series of steps marked by escarpments towards the north-west to about 800', forming a fairly steep coast between Cape Wilson and Cape Robert Brown. The open rolling country of the upland area has many rock outcrops along the ridges, the till cover being continuous only in the extreme north-east. There are a number of large eskers, predominantly running in an easterly to north-easterly direction. The Barrow River enters the sea by a 90' high waterfall. Relief is generally strong but decreases in the west where the flatter areas are covered with a sparse, marshy tundra in summer.
- 6) Parry Bay Lowland: This constitutes the eastern equivalent for the Wales Island region in the west. The land rises to about 20' or 30' close to the coast and there it is nearly horizontal, rising gently until the scarp of the inland plateau is reached. The Jenness River is the largest, entering the sea out of a 30' gorge. Limestone outcrops extend to Hooper Inlet and Quilliam Bay with a maximum width of 35 miles in its central part of which Hall Lake constitutes the western boundary. In the northernmost section near Quilliam Bay there are high limestone scarps - straight and long and difficult to traverse. The highest elevation of this region is the 500' hill on Igloolik Island. Movement in general is easy and becomes difficult only near the interior upland scarp on the western boundary of the region. Though inshore shallow conditions prevail, well-drained raised beaches and larger quantities of gravel and shingle compensate as far as settlement construction is concerned.
- 7) Sarcpa Hills: The hills rise steeply from the west side of Hall Lake and Parry Bay to 720' in the north and up to 1,400' near the Garry Hills. The Sarcpa Hills are differentiated from the Garry Hills through the absence of drift. The topography is extremely rugged with numerous 100' high rock walls. There are many more small lakes than on the Barrow Plateau. Sarcpa Lake itself consists of a series of smaller lakes interconnected by short streams. The lake level is 300' to 400' below that of the surrounding hills. From the lake, the Sarcpa River flows to Hall Lake.
- 8) The Garry Hills: These hills are an upland area separating the northern and southern parts of the Prince Albert Plateau. They

are generally lower than the plateau but rise to 1,500' near the axis of Melville Peninsula. In the west the lower sections of the hills are drowned, forming deep inlets and numerous small rocky islands which are up to 400' high.

- 9) The Hall Transition Region: This lies between the limestone lowlands in the east and the Garry Hills in the west. A 75' to 150' high bluff forms the eastern boundary overlooking the lowlands which in some areas turns into a drift-covered slope. Local relief seldom exceeds 150' but the area is difficult to cross in summer because of the many lakes and marshes.
- 10) The North Melville Drumlin Field: It extends for about 70 miles across the Peninsula with a width of 10 to 20 miles. The drumlins, which are underlain by crystalline rocks form elongated, tundra-covered ridges. There is also a considerable amount of till. In the till areas in particular, there are numerous small marshes.
- 11) The Fury and Hecla Hills: These extend across the middle of Fury and Hecla Straits - including Liddon, Ormonde and Elder Islands - from the northern Melville uplands to an area on Baffin Island from Sikosak Bay to Gifford Fiord. Elevations rise to 1,100'. Predominant are small hill units separated by valleys containing some long and narrow lakes and a multitude of small ponds. The land rises steeply out of the sea on both shores. The valley sides are also steep.
- 12) The Autridge Hills: This area comprises the northern shore of Fury and Hecla Straits west of the Fury and Hecla Hills. Being formed of sedimentary rocks and silts and diabase flows, of which the latter are extremely erosion resistant, they appear as a range of prominent, peaked hills with a maximum height of about 1,500'. There are several large and relatively narrow lakes, extending predominantly north - south with lengths of up to 16 miles.
- 13) The Gifford Moraine Plateau: The plateau extends from the sea at Agu Bay, 150 miles inland to the east with a maximum width of 50 miles, separating the lowlands of Admiralty Inlet and Bernier Bay from the hill regions of Fury and Hecla Straits and Murray Maxwell Bay. It has a mean elevation of 700' to 900' and a gently undulating surface of thick glacial deposits, underlain by granitic rocks. The most outstanding feature is a 100-mile long steep bluff often exceeding 100' in height from "The Wall" on the Gifford River, just east of its sharp bend to the south to the head of the Kukaluk River and continuing to Thalbitzer Peninsula. Of the two deep valley systems, one contains Nyboe Fiord and Ivisarak and Saputing Lakes, the other the Gifford River.
- 14) The Murray Maxwell Hills: These hills are basically a large granite block cut into half by Gifford Fiord, reaching heights





Figure No. 4: [REDACTED] Last ice in Fury and  
Hecla Strait — Looking south

Figure No. 5: [REDACTED] Looking up Nutridge Bay



of 1,000'. They are rolling hills with smooth slopes, the upland surfaces being generally barren with little overburden.

- 15) The Saputing Plain: This plain is a small triangular area with sides about 20 miles long, sloping gently towards Bell Bay. It is underlain by pure sand of unknown depth and completely covered by marsh tundra interspersed with thousands of small ponds 6" to 9" deep. The floors of the ponds are covered by a mass of water plants overlying 9" of organic material. The plain is hard to cross in summer but provides abundant nesting areas for breeding waterfowl.
- 16) The Channeled Lands: These are a 16-mile square outlier of sedimentary rock - mainly sandstone - consisting of mostly barren low hills rising 300' above the Saputing Plain. Their characteristic feature is the large number of channels up to 100' deep cut by melting waters into the sides of the hills.
- 17) The Fall River Plain: This plain is flat monotonous and continuous tundra, dotted with many small lakes and swamps.
- 18) The Buttes Region: The Buttes are outliers of sedimentary rocks on a granite base rising approximately 200' above the plain. Their tops are barren. Between the Buttes are bouldery ground moraines with thick tundra vegetation between the boulders.
- 19) The Berlinguet Plain: This is an extremely flat low-lying area often less than 100' above sea level and is underlain by limestone. The plain is covered by many small, irregular lakes, formed by marine and terminal moraine ridges, which are often interconnected by marshes.
- 20) The Harder Plain: This plain lies west of the 1,000' high scarp which continues north from the east side of Steensby Inlet. It is on the whole quite flat, rising gently to about 200' and 350' in the west with occasional steep-sided knobs about 75' high. The plain is largely drift-covered though there are some low rocky granite ridges and granite boulders of up to 15' in diameter. Drainage is not good and there are numerous lakes.
- 21) Thalbitzer Peninsula and adjacent islands: They are part of the Foxe Basin lowlands and are flat plains not rising to more than 200'. The surface consists of shattered limestone and sandstone draining into shingle with infrequent streams and lakes. Vegetation is usually thin except in some poorly drained marshy areas. The area includes the eastern part of Jens Munk Island, the western part of which is formed of precambrian intrusives giving it a low, rugged surface. The area extends as far as Rowley Island which consists of a series of harder



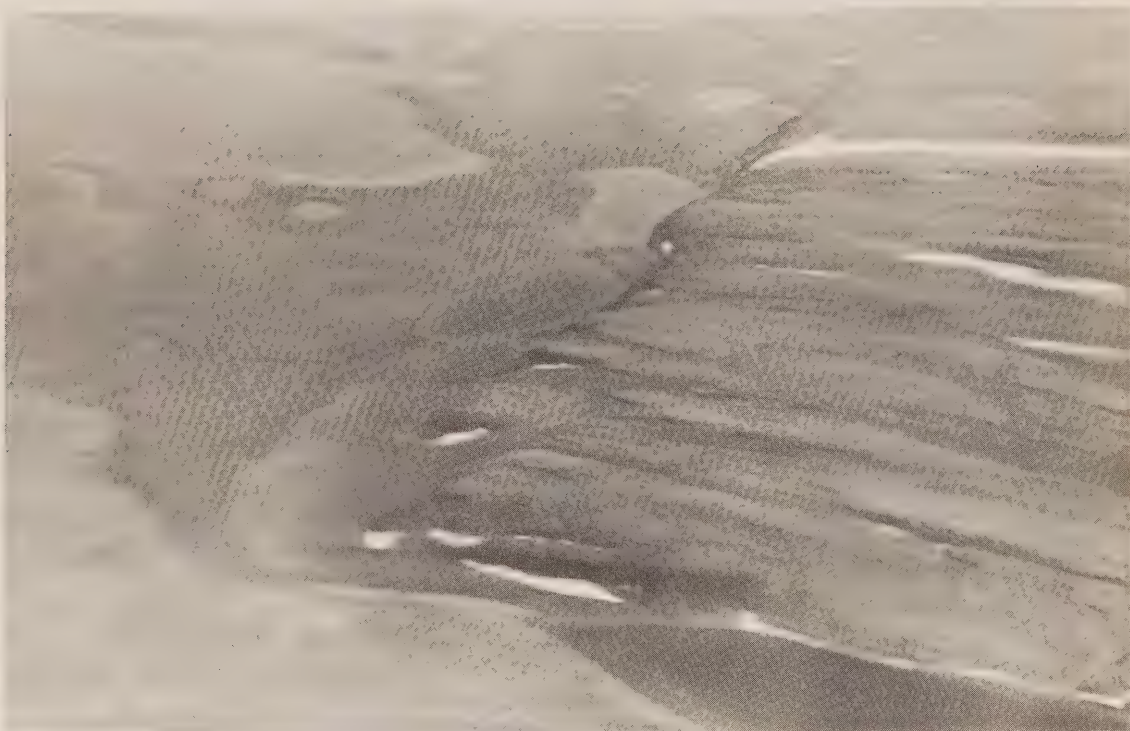


Figure No. 6: Coastal Scarp - Jens Munk Island

Figure No. 7: Gillian Lake - Baffin Island



limestone plateaus with a cover of shattered limestone and glacial deposits.

- 22 & 23) The West and East Inuktorfik Hills: The western part has some similarities with the Buttes region. The limestone overlying a granitic base is dissected into ridges. The plateaus generally have flat summits with elevations up to 800' or 300' above the large shallow lakes between plateaus. The eastern part, which joins up with the Rowley drift plateau, has a heavy drift cover broken by granitic knobs and ridges. The western part drains into Inuktorfik Lake and the eastern part into Pillik Lake.
- 24) The Rowley Drift Plateau: This covers an extensive region in central Baffin Island north-west of the Barnes Plateau. Summit elevations reach almost 2,000' and local relief 200' in gently rolling uplands areas but exceeding 1,000' along large rivers, which often connect series of long narrow lakes. There are small remnants of ice caps, still receding. The drift cover varies widely. The area is crossed by some old established Eskimo sledging routes, the main one passing along the Rowley River to the head of Cambridge Bay.
- 25) The Rowley Hills: These hills are a broad belt of broken country rising from the rocky coast of Steensby Inlet north-eastward with elevation of 1,200'. They are partly covered by thin boulder drift with extensive sand and gravel beds in deeper valleys and marshy areas about the mouth of Rowley River.
- 26) The Gillian Hills: These adjoin the Rowley Hills to the south, extending along the coast to the Piling Lowlands. Though elevations do not exceed 900', local relief is as much as 700'. Lake Gillian lies in the deepest of the valleys, others form inlets such as Eque Bay and Isortoq Fiord. In some valleys, drift plugs form series of lakes connected by rivers. The rivers from the Barnes ice cap carry a lot of silt which is deposited in the lakes. The hills have a discontinuous thin boulder drift cover.
- 27) The Flint Plateau: This is a transition region between the Gillian Hills and the Barnes and Rowley plateaus. There is little local relief between the major south-westerly oriented river valleys which are generally fairly wide with rugged sides, while many tributaries flow in deeply incised, narrow V-shaped valleys. The plateau has a thin and discontinuous drift cover and an irregular drainage pattern.
- 28) The Barnes Plateau: This plateau lies on the eastern margin of the survey area. Several major rivers originate from the ice cap. There is a varying amount of drift cover over crystalline precambrium.
- 29) The Clarke Upland: This is a 10 by 50 mile belt along the





Figures No. 8 & 9: Baffin Island - Krag Mountains as seen  
on flight along Phillips Creek



mainland coast between Wordie and Piling Bays and forms several steep-sided islands. It is 350' to 400' high and bounded by steep bluffs containing several lakes in often marshy valleys as much as 200' below the general level.

- 30) The Piling Lowland: This lowland region stretches from Piling Bay into southern Baffin Island. It is a country of low, rocky ridges and in the shallow valleys are numerous lakes. These are often formed by drift plugs and spill over into each other. East of Piling, marine silts are found up to 20 miles from the coast.
- 31) The Central Baffin Drift Plateau: This is the southward continuation of the Barnes Plateau, having a well drained heavy drift cover and summit elevations of 1,300' to 2,000'.

### Coastlines and River Systems

The west coast of Melville Peninsula is typical of many granite shield areas. It is on the whole straight and broad in outline though it has many small open bays with sand and pebble beaches. Access to inland areas is restricted through narrow valleys. Only at Garry Bay, and to a lesser extent at Encampment Bay, do the extensions of mountain ranges provide a more broken coastline with a number of quite steep islands in front of it. In the northern part, the unprotected harbours, severe ice conditions and widespread shallows make the coast most unsuitable for marine traffic except by small boats and canoes during the short open season.

Fury and Hecla Strait, separating Melville Peninsula and Baffin Island, is about 125 miles long and 10 to 40 miles wide. There are many islands and the Strait thus consists of a number of quite narrow channels; the main one of which is only 11 fathoms deep. Depth increases to 30 and 100 fathoms at both ends of the Strait. In most locations, the shores of the Strait rise abruptly as rocky bluffs to heights of 200 to 1,000 feet. Small bays with sandy beaches commonly separate the headlands, though some coasts, particularly south of Amherst Island, are straight and have no landing points. The north coast offers very little shelter. Throughout the Straits, bad tidal currents - strong enough between the islands to keep some leads open all winter - and bad ice conditions make shipping difficult throughout the open season.

The north-western shores of Foxe Basin from the head of Hooper Inlet to Parry Bay - including those of Igloodik and Neerlonakto Islands and of parts of Jens Munk Island, but excluding those north of Hooper Inlet, which are generally rocky - are distinguished mainly by two factors: the limestone base and the slow but continuous rise of the land after the last glaciation. Coastal waters are generally shallow and limestone gravel beaches rise in successive terraces. In some parts, particularly around



Hall Beach, lagoons and shallow lakes between the raised beach ridges are common. On the inland sections of Parry Bay where crystalline rocks crop out, cliffs and low bluffs dominate the coastline. The two largest bays on this coast - Parry and Foster - are on the whole too shallow and have fast ice too long to be of much use for shipping. Turton Bay on Igloodik Island, however, is good for anchorage through the winter.

On Baffin Island, the coast northwest of Fury and Hecla Strait is mainly open, with Agu Bay and its extensions - Nyeboe Fiord and Foss Fiord and the two bays form the neck of Kimakto Peninsula, the only deep indentations. From Cape Hallowell to Nyeboe Fiord the coast is hilly while from the western shore of Foss Fiord and north-westwards the coast becomes quite flat with wide open limestone gravel beaches. The same type of coastline predominates on Crown Prince Frederick Island.

East of Fury and Hecla Strait, the coast of Baffin Island, as far as the head of Steensby Inlet - with the exception of the eastern side of Thalbitzer Peninsula, which has less shoal water and flights of raised beaches to the interior - as well as the coasts of the islands (Koch, Rowley, Bray, Spicer, Foley, Prince Charles and Air Force) have very low and shallow shores with frequent boulder reefs inshore. This forces ships to anchor well off-shore, exposed to wind and ice, though movement over the hard gravel and shingle beaches is generally easy.

The southern part of the eastern shore of Steensby Inlet is a steep straight bluff rising 250' out of the water. At the head of the inlet are rocky promontories and numerous islands with boulder beaches. At the mouth of Rowley River the shoreline is flat again, in parts shallow and muddy. Continuing to the south, the arms of Grant Suttie Bay and Eque Bay are steep and Fiord-like.

Ikpik Bay and Baird Peninsula have flat shores up to two miles wide, rising gently from the water. Ikpiik Bay specifically has many sand and shingle beaches.

From Longstaff Bluff to Wordie Bay, the coast is again dominated by low, rocky headlands which drop steeply to shore. The bays are separated with mud and boulder tidal flats in places two miles wide. There are many rocky shoals and islands. Near the northwest entrance to Piling Bay and in Wordie Bay near Nichols Bluff the water is fairly deep close to shore.

Though none of the river systems in the area are navigable except for small boats and canoes, some do play a fairly important role on account of their char runs and as routes for dog team travel. Hydro-electric potential, no doubt, exists but so far no investigations have been carried out.

On Melville Peninsula, about three-quarters of the southern and northern parts drain into Foxe Basin and only one-quarter into Committee Bay. Only in the centre part, between Garry Bay and Hall Lake, does the height of land divide the Peninsula about evenly. From south to north,

the more important systems are:

- 1) The Aua system, emptying into Falmer Bay: The Eskimos fish occasionally for char at its mouth and occasionally it provides access to usually fair caribou country.
- 2) The Barrow system: The 90' high fall at the mouth of the Barrow River cuts off char migrations, though the drainage basin is large and contains several large lakes.
- 3) The un-named river system emptying into Parry Bay west of Ignertok Point: There is a limited amount of char fishing at its mouth. The rapids in the middle reaches prevent char from reaching the large lake upstream. Several regular caribou crossings in its last 40 miles are hunted regularly by Eskimos by canoe.
- 4) The Hall Lake-Ikerasak system: This is of considerable importance due to the good and reliable char runs at its mouth. Some of the smaller rivers running into Hall Lake are used in winter for access to inland caribou areas.
- 5) Mogg Bay and Crozier River systems: Both have char runs important for the Igloodik people. Quilliam Bay and the small river, that may be reached from its head and empties into Fury and Hecla Strait south-east of Amherst Island, form part of the regular dog team route between Igloodik and Agu Bay.

In the west part of Baffin Island, the small rivers running into Foss Fiord are being fished for char. To the east are the Gifford River, which is used occasionally for dog team travel between Arctic Bay and Igloodik, the Kukaluk River which, together with some smaller rivers running into Murray Maxwell Bay, is fished for char by the Kapueevik camp, and the complex of rivers and lakes draining into the northwestern arm of Steensby Inlet. Here the Inuktorfik Lake-Pillik Lake system will be investigated by Baffinland Iron Mines Limited for its hydro-potential. Erichsen Lake may have under-exploited fish resources. Following the coast of Baffin Island to the southeast, there is the Rowley River - important as a sledging route to Cambridge Fiord - and finally the systems of the Drewry and MacDonald Rivers and the rivers running into Flint and Piling Lakes. These latter systems, mainly carrying melted water from the Barnes Ice cap, carry considerable amounts of silt; so much, in fact, that the waters of the lakes appear opaque and their fish population is probably negligible.

### Climate

Climatological information for the survey area is somewhat sketchy. There are only three reporting stations in the survey area, operating for less than a decade. They are at W.B. Smith Bay, Sarcpa Lake and Hall Beach.



For the past two summers, records were also kept at Mary River and at Milne Inlet. The weather situation in this part of the survey area is dealt with in the chapter on Baffinland Iron Mines.

The overall weather situation in the survey area is governed - as in most of the eastern Arctic - by the seasonally shifting relationship of the Mackenzie Valley High and the Davis Strait - Baffin Bay Low. This characteristic pattern begins to form in the fall and by November a deep trough over Hudson and Davis Straits and a strong high pressure ridge over the Mackenzie Valley are well defined. Though this pattern remains on the whole stable, its boundaries do not, with surges of polar air travelling southward out of the high pressure area and cyclonic storms from eastern Canada and the United States moving north-eastward towards the Davis Strait Low. From January to March a secondary Low forms along the west shore of Hudson Bay while the <sup>Davis Strait</sup> low gradually begins to fill up. The High spreads out in April to cover most of the east-central Arctic, its axis reaching from Axel Heiberg Island to Churchill, giving the area excellent flying weather. In May a further strengthening of the high pressure area occurs. Then a sharp drop in mean pressures occurs during June and they decline further until August. In July, pressure gradients almost disappear. In August a high pressure ridge begins to reform over Boothia and Melville Peninsulas, but numerous weak disturbances cross the area. In September and October pressures in general rise until the winter pattern is again established.

Wind data are given in graphs #1 and #2 and temperature and precipitation data are given in table #1.

Mean temperatures range from -30 in January to +49 in July. The mean annual temperature at Hall Beach for the last five years was +6°F. This compares with +3°F at Eureka on Ellesmere Island and +16° in the Mackenzie Delta. Mean monthly temperatures are lowest in February (-21°F) and rise to an annual maximum in July (+43°F). The records at W.B. Smith Bay and Sarcpa Lake, though incomplete, show similar means.

The mean annual precipitation is about 8.5" of which about 4.5" is in the form of snow, which may fall in any month, though only minimal quantities fall generally in July and August; May and October are the months of maximum snowfall. Rain falls mainly from May to September, with maximum amounts in July and August when the wind veers to the north. During winter, spring and summer on the west coast, there was calm weather for more than 30 per cent of observations. Calms at Hall Beach accounted for less than ten per cent of observations during any month.

Records of cloudiness are fragmentary. Maximum cloudiness on both the east and west coast of Melville Peninsula occurs during September and October. It might be said that during the summer months clouds are continuously generated over Committee Bay when air masses, warmed up over the snow free land areas, are brought into contact with the ice that often covers most of Committee Bay through the whole summer.

Table No. I

## Averages and Extremes of Climatic Data for Hall Beach

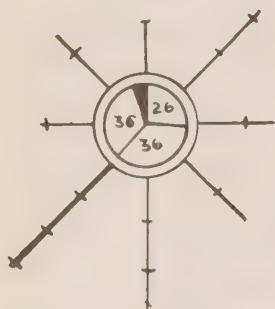
Month	Air Temperature				Precipitation				Total Water			
	Mean of Daily		Mean of Monthly		Rain		Snow					
	Mean Daily °F	Maximum °F	Minimum °F	Maximum °F	Highest Recorded °F	Lowest Recorded °F	Mean Amount	Days	Mean Amount	Days	Mean Amount	Max. fall in 24 hrs.
January	-24.1	-16.6	-31.5	-47	34	-55	*	*	3.2	11	0.32	0.13
February	-24.8	-17.6	-32.0	-49	30	-54	0	0	3.8	7	0.38	0.61
March	-27.0	-19.1	-34.8	-47	24	-52	0	0	2.1	6	0.21	0.10
April	-4.2	5.3	-13.7	-37	32	-44	*	*	3.8	10	0.38	0.19
May	12.6	21.3	3.8	-14	38	-18	*	*	6.7	10	0.67	0.70
June	33.1	37.9	28.3	16	55	1	.17	3	1.5	5	0.32	0.20
July	43.0	48.9	37.0	31	65	29	1.55	10	Tr.	0	1.55	0.80
August	40.1	44.8	35.4	31	60	27	1.57	10	0.5	1	1.62	0.83
September	30.9	33.9	27.9	17	53	11	.39	4	6.3	12	1.02	0.49
October	12.2	18.7	5.7	-14	35	-21	*	*	9.1	13	0.90	0.60
November	-4.1	3.5	-11.7	-35	32	-40	*	*	7.6	14	0.73	0.31
December	-15.3	-7.4	-23.3	-39	23	-48	0	0	4.1	13	0.38	0.10
Year	6.0	12.8	-0.7	-17	65	-55	3.68	27	48.7	102	8.48	0.83
Period	1960 - 1964				1956-1964		1960-1964					

\* Average less than .05 In.

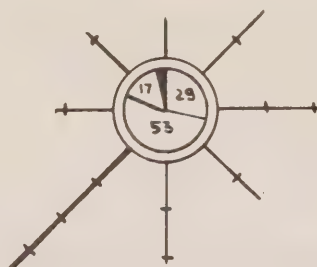
Source: Meteorological Branch - Department of Transport



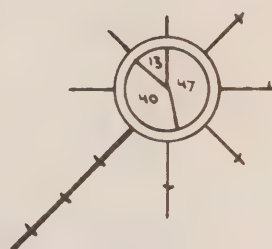
JANUARY



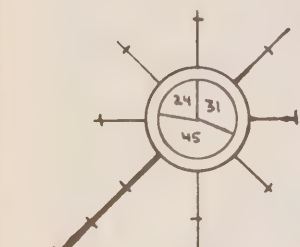
FEBRUARY



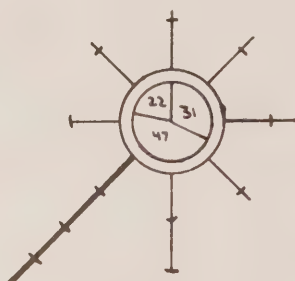
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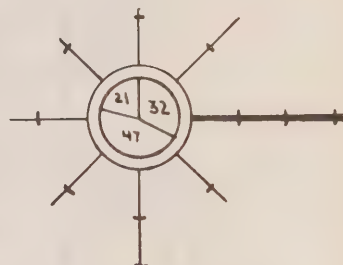
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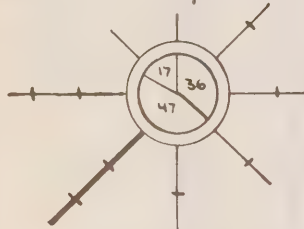
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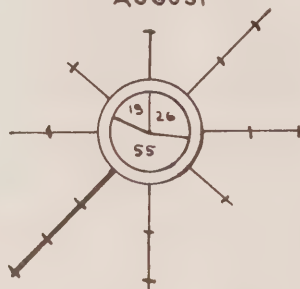
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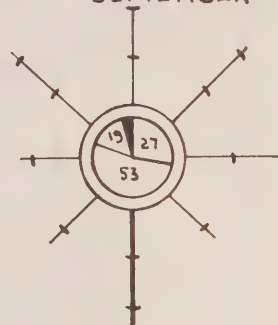
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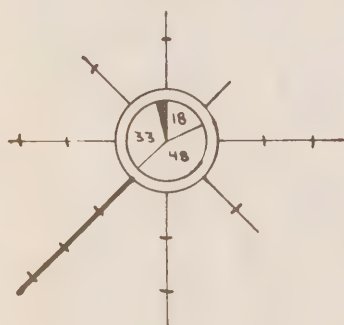
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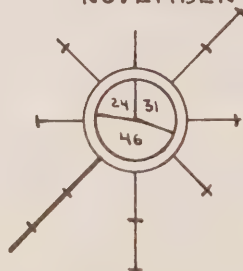
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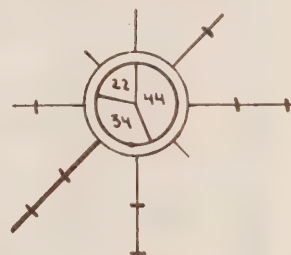
OCTOBER



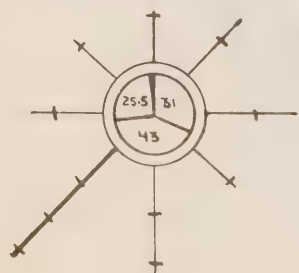
NOVEMBER



DECEMBER

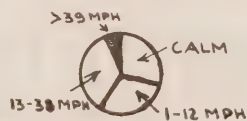


YEAR

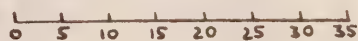


## LEGEND:

INNER CIRCLE: WIND STRENGTHS  
PERCENTAGES OF TOTAL OBSERVATIONS

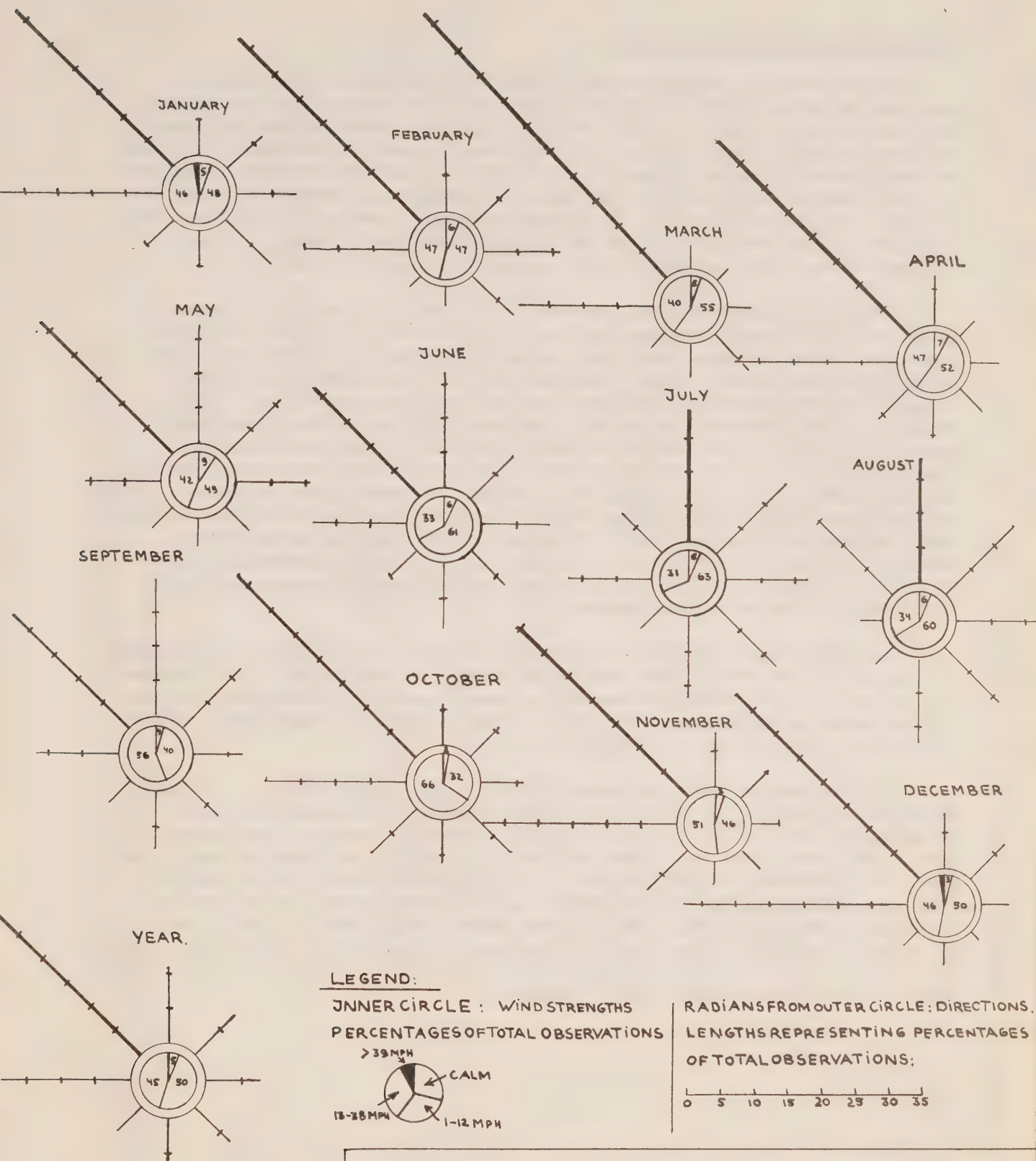


RADIANS FROM OUTER CIRCLE: DIRECTIONS  
LENGTHS REPRESENTING PERCENTAGES  
OF TOTAL OBSERVATIONS:



GRAPH NO: 1

PERCENTAGES OF CALMS AND OF WINDS FROM 8  
CARDINAL DIRECTIONS AND MEAN MONTHLY WIND STRENGTHS.  
FOR WEST MELVILLE (4 YEAR RECORD.)



GRAPH NO: 11

PERCENTAGES OF CALMS AND OF WINDS FROM 8  
CARDINAL DIRECTIONS AND MEAN MONTHLY WIND STRENGTHS.  
FOR HALL BEACH. (4 YEAR RECORD.)



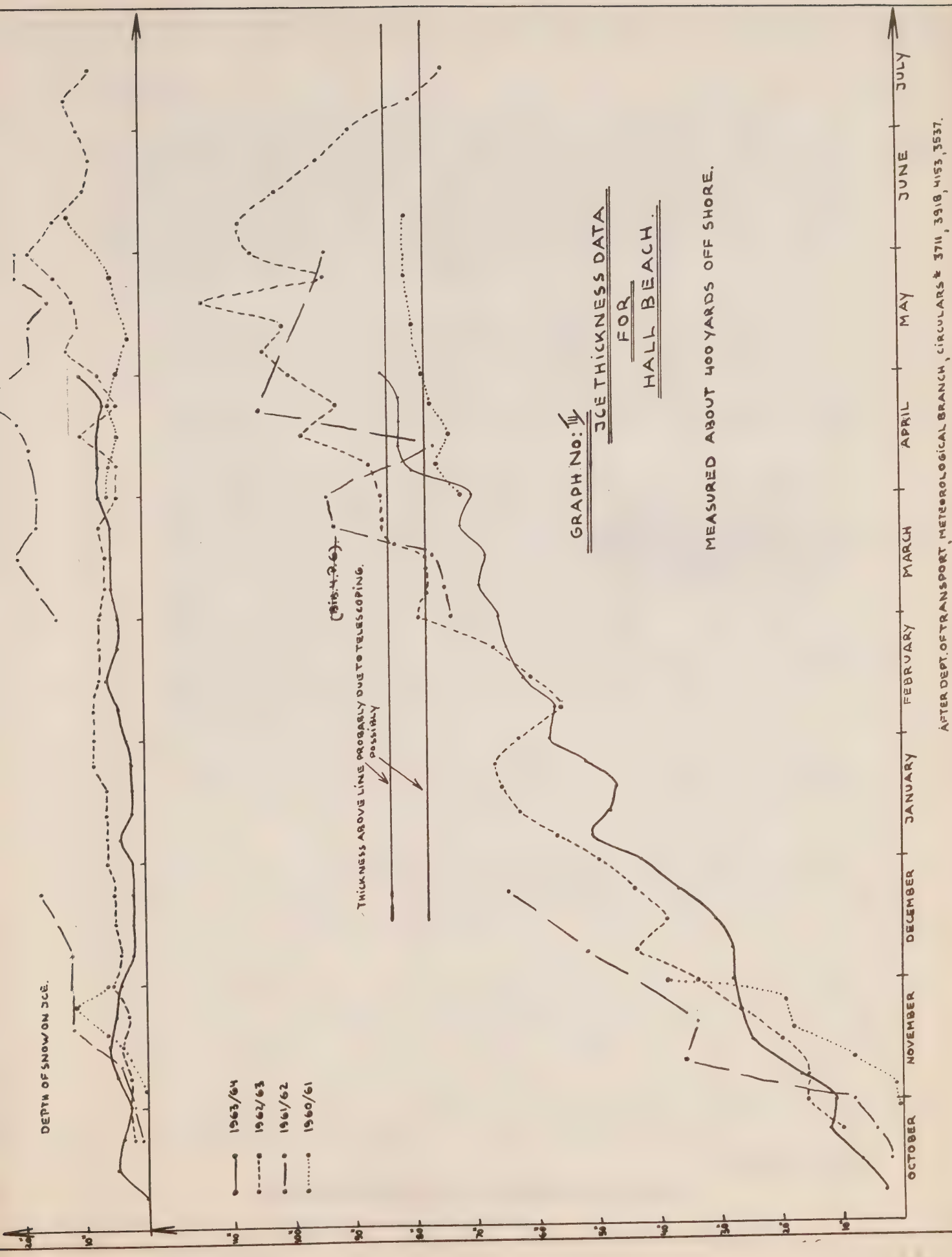
## Sea Ice Conditions and Currents

The determining oceanographic feature of Foxe Basin is a slight counter-clockwise whirl. This whirl is formed by waters entering through Fury and Hecla Strait. Of this, only the portion moving along the east coast of Melville Peninsula and the north-east coast of Southampton Island escapes directly through Hudson Strait while the waters moving southwards further towards the centre of the Basin are deflected northwards again by the coast of Foxe Peninsula. It should be noted, however, that tides and wind often drive the ice against or across this light current. Tides throughout Foxe Basin generally are between two and five feet.

Freeze-up begins early in October (see graphs #3 and #4). Break-up starts at the mouth of Fury and Hecla Strait and by mid May there is open water south to Cape Penrhyn. The strip of fast ice along the shore of Melville Peninsula gradually melts until it disappears by late July or early August. However, through June and July the shore lead, which varies in width between  $\frac{1}{2}$  mile and 20 miles, is often closed completely by easterly winds. The worst ice conditions occur between Rowley and Bray Islands, where ice covers between 7/10 and 8/10 of the water throughout the summer. Fast ice completely covers the larger bays in winter; along the straight coastline along the Melville side it is between four and ten miles wide, on the Baffin coast south of Wordie Bay one to four miles wide; and eight to ten miles wide north of it. Strong tidal currents in Clarke Sound and in the centre part of Fury and Hecla Strait often cause open leads even in the middle of winter.

The Foxe Channel coast of Southampton Island and of Melville Peninsula as well as Frozen Strait have among the worst ice conditions in the region. The southerly current brings down dirty, heavy pack ice throughout the year, with an average thickness of up to 8'. Where pressure ridges have formed floebergs, it may be up to 30' thick.

In Foxe Channel fast ice rarely forms to any great extent. Little detailed information is available on ice conditions in Committee Bay. Break-up presumably occurs late in July or early in August, but conditions remain bad throughout the summer as fresh ice drifts in from the north and jams into the south end of the Bay. In 1847 Reese found the Bay full of ice throughout August. The extensive pack ice throughout the summer and the shallow waters prevent anything but occasional travel by small boats or canoes south of a line from Cape Chapman to Garry Bay. From Crown Prince Frederick Island the use of Longliners or Peterheads during the summer for whale hunting would appear quite feasible.



AFTER DEPT. OF TRANSPORT, METEOROLOGICAL BRANCH, CIRCULARS # 3711, 3918, 4153, 3537.





GRAPH NO: IV

RELEVANT BREAK-UP AND FREEZE UP DATES.

## Geology

Geological information available to date on the area is consolidated on maps 3-1958 (Fury and Hecla Strait) and 4-1958 (Foxy Basin North) of the geological survey of Canada and in "Additional Notes...." by R.G. Blackadar, paper 62-35, GSC, from which the chronological summary given below is largely taken. Map #3 gives the general geology. Here, only a short summary is given and the introduction is quoted from I.F. McQuat "Mineral Potential and Project Development in the Eastern Arctic", CIMM Transactions, Vol. LXVII p.p. 282-288:

"Essentially, all of the rocks are Precambrian in age with the exception of those in parts of Baffin Island. The most important rocks, essentially metamorphosed sediments and basic intrusives, are the Proterozoic formations which are found in the Labrador trough, the Ungava nickel belt, in small belts along the eastern shore of Hudson Bay north of Great Whale River and at the northern tip of Baffin Island.

These areas, with the possible exception of some of the Paleozoic formations on Baffin Island, offer the best opportunity for the discovery of economic deposits. This thought is supported by the fact that about 90 per cent of the several million dollars of exploration expenditures made to date have been on these known Proterozoic belts or in efforts to find more of them. The rocks within these general belts have great variety. The rock types identified lack possibly only Kimberlite to complete a full suite of formations capable of generating orebodies. A curious point is that significant amounts of precious minerals have never been reported. There have been rumors of gold-bearing sands in the Great Whale River area and of molybdenum occurrences southeast of Great Whale, but no factual records are presently available.

The exception which proves my Proterozoic rule is the occurrence of lead-zinc-silver deposits at Admiralty Inlet on Baffin Island, which are reportedly found in Ordovician Limestone. Undoubtedly, there will be other exceptions in the future".

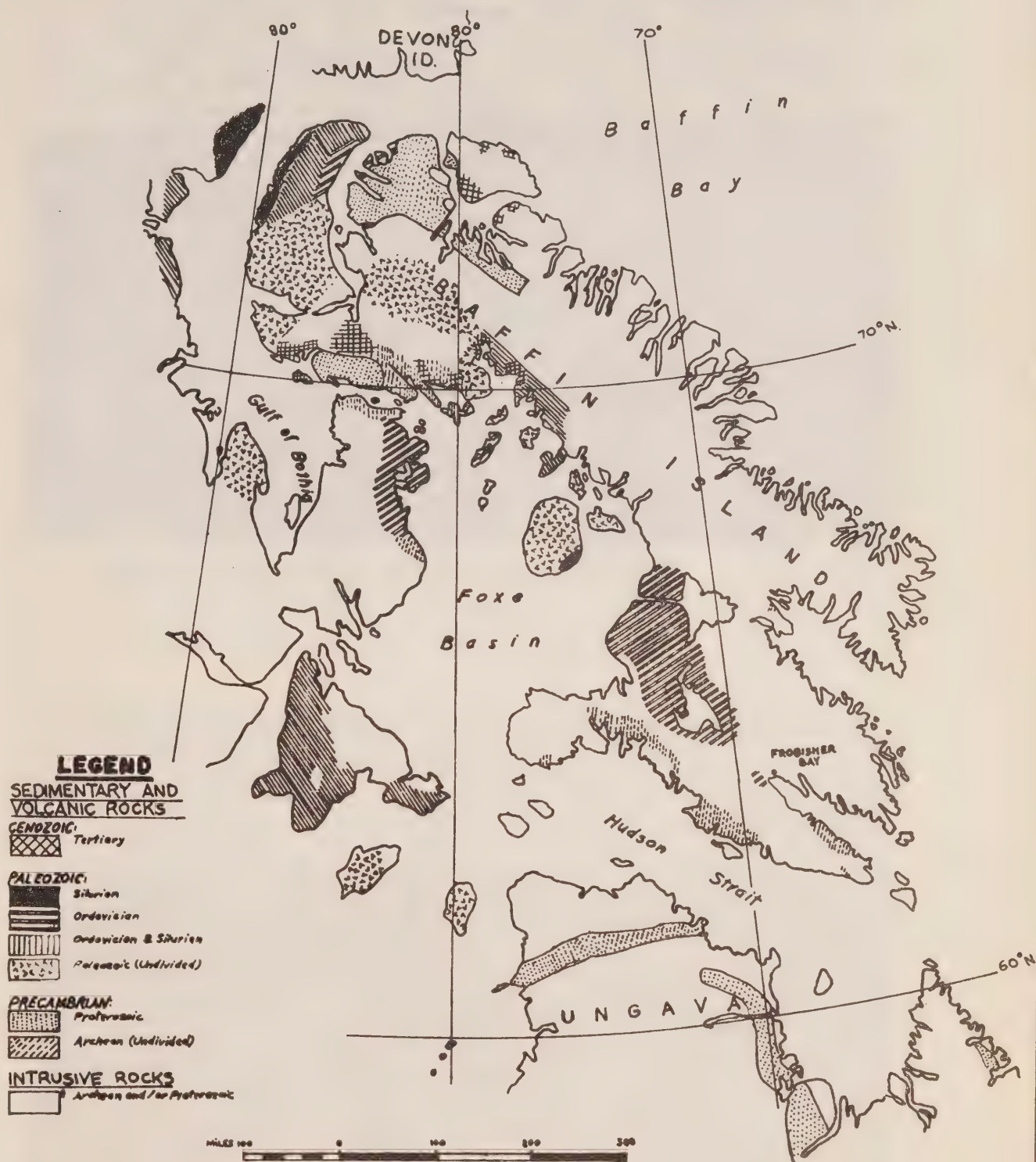
This summary of the regional geology does not show bright prospects within the survey area proper - with the exception, of course, of Baffin Island Iron Mines which is dealt with in detail in a separate chapter. The distribution of the more important formations through the survey area - in chronological order - is as follows:

- 1) Archaean pregranitic rocks crop out north of Richards Bay (metavolcanic, often highly altered) and south of it (Quartzitic) and on the Bouverie Islands (metavolcanic and pillow-lavas). The sedimentary rocks of the same group are mainly quartzitic, forming one small island east of the main Bouverie Islands and three more north of Igloolik. All these rocks are frequently intruded by granitic rocks with contact-metamorphic zones of widely varying widths. Basic metasedimentary rocks outcropping south-east of



Isortoq Fiord and continuing inland are intruded by granitic sills and dykes. This group hosts considerable beds of magnetic and iron formation, the latter up to 100 feet thick. The dark micaceous rocks outcropping between Grant Suttie and Eque Bay are also pre-granitic in origin. Archaean granitic and gneissic rocks, often cut by quartz-feldspar granites and pegmatites are the most abundant types in the survey area. Outcrops occur from Ikpiik Bay to the north end of Steensby Inlet, continuing to Nina Bang and Neergaard Lakes, on Jens Munk Island, and Siorarsuk Peninsula. The outcrops continue on the west side of Gifford Fiord to Sikosak Bay, form the island bridge across Fury and Hecla and most of its southern shore and on the northern shore a zone of 6 to 8 mile width separated from the coast by a zone up to 6 miles wide of proterozoic limestones and shales between Sikosak Bay and Agu Bay, and continuing to Navarana Lake.

- 2) Proterozoic and/or Lower Cambrian sediments, usually relatively altered and gently folded, show up in rare outcrops north of Steensby Peninsula and - 140 miles to the southwest - along the northern shore of Fury and Hecla Strait in a wide open belt from Sikosak to Agu Bay. In that area all beds strike about parallel with the strait and dip  $10^{\circ}$  S, suggesting a minimum thickness of 15,000' for the quartzites. The upper beds (slate, siltstone, limestone and dolomite) of Alfred and Amherst Islands in the strait and near Cape Appel, may exceed 1,500 feet. All units of the group rest unconformably on the precedent granites and gneisses. Other outcrops at which the succession was studied in detail occur at Cape Einar Mikkelsen north of Cape Tordenskjold and southwest of East Cape. These sedimentary strata are often cut by presumed Ordovician gabbro dykes. Gabbro dykes and sills of proterozoic or lower Cambrian age are numerous in the same areas, the largest of these sills forming the Peninsula separating Autridge Bay from the western entrance to Fury and Hecla Strait. The well-developed jointing in the sills shows up well on air photographs.
- 3) Palaeozoic sediments, though presumably underlying most of the coastal lowlands of northern Foxe Basin, outcrop rarely, because ice and frost action break up the surface layers to form extensive beds of limestone, shale and sandstone gravels. The outcrops that do occur, often form the tops and flanks of mesas as at Jungersen Bay - when the strata are flat-lying or, when they are inclined, scarps as at Berlinguet Inlet. Flat deposits are also exposed in the steep banks of the lower reaches of the river flowing into Mogg Bay. Palaeozoic talus, with occasional outcrops containing specimens of typical "Arctic Ordovician" fossils, were reported from Saputing Lake, Kimakto Peninsula, Quilliam Bay, the slopes behind Igloolik village, Crown Prince Frederick Island, Neerlonakto Island, the eastern part of the Jens Munk Island and the other islands of Foxe Basin. The "Gallery Formation" of north-western Baffin Island belongs to the same general group.



MAP NO. 3

GENERAL GEOLOGY

FOX E BASIN AREA.

(CONSOLIDATED FROM BIR FIELD REPORT #2 AND GSC MAPS 3-1958 AND 4-1958).



- 4) Quaternary deposits consist mainly of glacial drift and of the innumerable raised beaches which result from the marine submergence accompanying and following the latter stages of glaciation and the subsequent isostatic emergence. Large eskers occur north-west of Steensby Inlet and south of Bell Bay. Highest altitudes determined for marine shells and raised beaches on Melville Peninsula range from 404 to 440 feet respectively.



Figure No. 10: Raised Beaches - Igloodlik Island



Figure No. 11: Frost Action on Limestone, Igloodlik Island



### Chapter III

#### FLORA AND FAUNA OF THE AREA

##### Flora of the General Area

Of the many species of plants growing in the Canadian Arctic Archipelago, of which in this context the survey area may be considered a part, only relatively few species are identified in it. This is, however, due less to the scarcity of species than to the fact that to date little detailed work has been done in the area by qualified botanists. For that reason, no detailed description of the regional vegetation and distribution of species can here be given. However, the subsequent account of the vegetation of Igloolik Island, contributed by a botanist, may be considered fairly representative of large parts of the region. Here, only the more important environmental factors determining the vegetation will be summarized.

The region lies to the west of the mountain range that stretches from Labrador over Baffin Island to Ellesmere Island and just between the two breaks in this barrier - Hudson Strait and Lancaster Sound. This mountain range forms an effective barrier to free air flow. The area to the west of the barrier is generally colder and has lower precipitation than the east slope of the range. That is, the climate is more continental in character. Lancaster Sound forms a phytogeographical boundary to the north of the survey area. The many areas of open water within the area - though they do not compensate for the effect of the mountain barrier - still exert a moderating influence which prevents the occurrence of extreme temperatures such as those in the Mackenzie and in the Yukon.

The area lies entirely within the region of permafrost, but the depth of the annual thaw varies considerably from a few feet in sand, gravel or shingle to a few inches in wet, peaty soil. Phenomena deriving from the melt-thaw cycle, like soil creeps and mud flows on slopes or the development of polygons on level ground are generally detrimental to vegetation. The aeolian deposition of loess also limits the number of species in some areas.

The low temperatures of the soil greatly reduce organic decay by bacteria action which results in low availability of nitrates and phosphates. How important this lack is as a limiting factor is evident by the relatively luxurious appearance of vegetation near owl perches, goose nesting grounds, animal burrows, sites of past or present habitation or even just animal dung or skeletal remains.

##### The Vegetation of Igloolik Island \*

The vegetation is generally stereotype; its character stamped by the calcareous ground. On the well-drained gravelly soil on top of the plateaus and on the raised beaches, which are relatively snow-free early in the spring,

the vegetation is sparse and open, dominated by lichens, beside which grow *Dryas Integrifolia* (mountain aven) and *Salix Arctica* (Arctic willow) often accompanied by *Carex Nardina*, variety *Atriceps* (a sedge grass).

On the less exposed, but still well drained, soil a more dense, heath-like vegetation is found, dominated by the same three species as well as *Carix Rupestris*, *Carix Misendre* (other varieties of sedge grass), *Pedicularis Capitata* (lousewort) and *Saxifraga Tricuspidata* (prickly saxifrage).

On more wet, unstable soil showing polygon patterns the heath will change to a moist vegetation, still with diminutive, moss-rich, heath-like patches on top of the hummocks, but with *Arctagrostis Latifolia* (a seedgrass), *Equisetum Variegatum* (horsetail) and others in the wet patches between the hummocks.

This vegetation gradually changes to meadow-like communities, well saturated with water all through the summer and with open or oozing water in shorter or longer periods after rain. This community is dominated by sedges and cottongrass, first and foremost by *Carex Stans*, a coarse sedge, and *Eriophorum triste* (cottongrass). Besides, species like *Draba Lactea* (a white flowered dwarf perennial) and *Draba Alpina* (a larger yellow form of the same species) are present and *Salix Richardsonii* and especially *Salix Arctophila* and *Salix Reticulata* (various forms of Arctic willow), are of importance.

A special vegetation is found around the stones upon which snow-owls frequently perch. On this well-fertilized soil is found a rich flora harbouring a lot of species not to be found elsewhere on the island.

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\* The detailed information in this chapter was supplied by Mr. Bent Fredskild, of the National Museum of Denmark, who, it is understood, will shortly publish a detailed account of his botanical work in the area.



## The Economically Relevant Fauna

For the purpose of the report the description of the fauna will be divided into land-mammals, sea-mammals, birds and fishes, with the economically less important species only touched upon where they have a definite bearing on those that are important in this respect, and these being dealt with roughly in order of importance to the people.

### Land Mammals

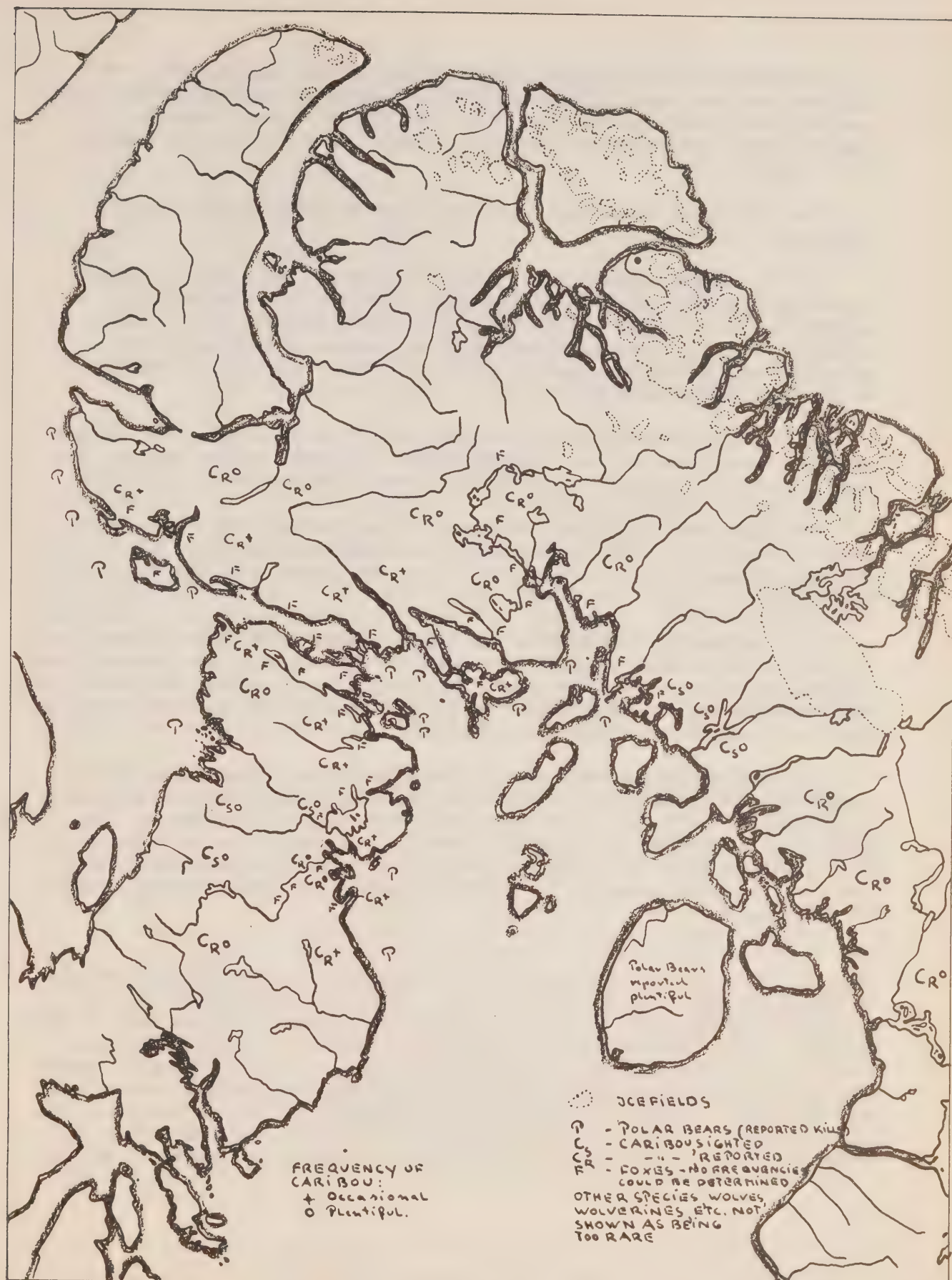
Caribou: To most of the Igloolik Eskimos, the Caribou has lately not been as important as to Eskimos in many other areas. No detailed estimates of caribou population are available for the area. From the accounts available emerges a picture of gradual increase over the past quarter century. This, however, may to some extent be due to increased intensity of observation.

In 1940 Manning reported that caribou migrated north over Rae Isthmus but were generally scarce in the region. Most were reported to live on the western side of the Peninsula from approximately 20 miles north of the Isthmus to south of Garry Bay - that is, in the area least frequented by natives. In the northern half of the Peninsula, caribou were believed to be almost exterminated by the large population at Igloolik, which at that time was often short of caribou skins. Caribou, however, were reported to be plentiful from the area north of Fury and Hecla Strait.

In 1953 Loughrey reported seeing small herds on Melville Peninsula throughout the year which spent the summer in the hilly country on the west side and the winter closer to the east side. He estimated that 175 to 200 were killed per year and reported that 150 skins were shipped in from Baker Lake. He reported also that in 1941/42 some Igloolik Eskimos hunted caribou in the Piling Bay region.

In 1962 A. Wight reported that 107 caribou were killed in a twelve month period, in an area roughly corresponding to that of the survey. He also mentioned that at that time no organized hunting trips were undertaken and that herds were increasing and more animals were moving north into the peninsula.

The 1964/65 Game Report by W.L. Donahue gives the first detailed breakdown of caribou kills in the area. According to the report, 85 animals were killed by hunters from the South Camp on Melville Peninsula, 50 by hunters from Agu Bay in the north-west corner of Melville Peninsula, 70 by Hall Beach and Napakoot hunters, 40 by hunters from Igloolik and 215 by hunters from the other camps on Baffin Island from Gifford Fiord to Piling Bay. The total kill was thus 460 for the year. During observation flights in early August 1965 caribou were most frequently sighted on Melville Peninsula in the area west



MAP 4: LAND-MAMMAL DISTRIBUTION IN SURVEY AREA  
 (Including Polar Bear Occurrences)



and south-west of Hall Lake, on Baffin Island in the area east of Gifford Fiord and north of Jens Munk Island and particularly in the area between Piling Bay and Eque Bay. Eskimos at Qaersut reported that in recent years caribou had again started to cross over to Jens Munk Island.

The following facts seem established in regard to caribou population and utilization:

1) If 27,000 square miles of land are assumed for the area over which Igloolik Eskimos hunt, containing, conservatively estimated 25 per cent or about 6,750 square miles of pasture, and assuming further a density of 10 caribou per square mile of pasture as well as a reproductive rate of 15 per cent per year, then the annual yield could be just over 1,000 head per year.

2) In the recent past the caribou population of the area has certainly been much less than this estimated potential but for reasons unknown, has been increasing markedly for at least the last three years.

3) Last year's kill may then well be in line with the sustainable yield appropriate to the present stage of population build-up, and should not be increased for a few years to ensure that optimum population density is reached.

4) Caribou are hunted more and more for meat alone and the need for skins is steadily decreasing as more manufactured garments are bought. The concentration of hunting during the few weeks in late summer when skins are most suitable for clothing after the old hair disappears and before the new hair is too thick, will therefore diminish.

5) Eventually, an increase of the current kill by more than 100 per cent seems quite feasible though to sustain an optimal yield the provision of guidelines by the Canadian Wildlife Service might be advisable. The importance of such an increase might be illustrated by the fact that with full utilization of the animal it would mean an average increase in the meat supply in the order of 50 pounds per person per year for every Eskimo in the area.

Foxes: The relative importance of fox trapping for the local economy has declined substantially in recent years. Revenue from fox furs for the period from January to December, 1964 amounted to about 18 per cent of cash income. The first fox furs are generally traded in November. The peak trading period is reached in December and the volume then gradually tapers off until April. A few skins of inferior quality are sometimes traded in May and June. Usually, no fox skins are traded from July to October. The Total number of furs traded during the 1964 calendar year was 1655 at an average price of \$10. Monthly average prices ranged from \$7.72 to \$13.93.

Some historical data on fox takes and prices may be of interest, though unfortunately, the available data is incomplete:

YEAR

1924	\$13.00/skin average
1925	15.00/skin average
1926	14.00/skin average
1927	14.00/skin average
1953	75 trappers using 20 to 25 traps each (range 10 to 150 traps per person). 369 skins traded by March. Past ten year average 1,000 skins per year, 2,500 to 3,000 in peak years.
1955/56	2772 skins traded at \$9.00 average price by 87 trappers for an average income of \$234 per trapper for an average of 26 skins.
1959/60	Total income \$37,376 for area from fox trapping or about 52 per cent of total income.
1961/62	Total fox skins traded 1878.
1964/65	Total fox skins traded 2,369 at an average price of \$8.28 for a total of \$17,595 by 34 trappers for an average of 69.5 skins per trapper or \$517 per trapper.

During the travels in the area in the summer of 1965 considerable numbers of abandoned traps were noted, most of them rusty or damaged beyond repair. Hardly any lemmings were noted anywhere, so 1965/66 is likely to be a bad fox season.

From the available data and observations, the following generalizations in regard to fox trapping seem justified:

- 1) The price of fox furs since the beginning of the period of intensive culture contact - which was to some extent triggered by the then prevailing level of fox prices - has decreased substantially in monetary and even more in real terms. The price level has been relatively low for some time now and there is no indication that it may return to the level of the twenties.
- 2) The number of active trappers in the area has declined absolutely and relatively though the efficiency of the individual trapper has on the average shown a marked increase.
- 3) On the whole, the most efficient fox trappers are also the most efficient seal hunters.
- 4) The tendency towards a decrease in the number of active trappers as a consequence of increasing sedentariness of the population and decrease in the number of dog teams will probably continue but there is no reason to suppose that the efficiency of the remaining trappers might not be further increased, perhaps by establishing a network of caches or even cabins.
- 5) To increase trapping efficiency it is also most important that lines be patrolled more frequently. There are numerous complaints about traps being robbed by wolverines, but this seems to be due more to infrequent patrolling rather than excessive numbers of wolverines.



- 6) Due to the cyclical nature of the fox harvest, fox trapping is likely to remain a supplementary activity. By improving spending habits and introducing an idea of budgeting through adult education its contribution to the living standards of the individual trappers may be substantially increased.

Polar Bears: The number of polar bears in the area is relatively small but due to the high value of each skin - in 1965 prices were in excess of \$100 per skin - any bear seen is hunted, and if killed, represents a substantial financial windfall. Only the people from Agu Bay go on special bear hunting trips, usually along the Baffin Island coast of the Gulf of Boothia. In the 1952-53 season 15 bears were killed in the area. In the 1961-62 season 59 bears were killed and in the 1964-65 season 25 bears were killed. Of these, two were taken by hunters from Igloolik and six by hunters from Jens Munk Island at the floe edge in north-western Foxe Basin; the others in the Agu Bay Area. The latter were presumably from the Gulf of Boothia area and the others presumably wandered into north-western Foxe Basin either from the Gulf or possibly from the Prince Charles Island area where they have been reported as being plentiful. Of the bears killed in 1961/62, most were taken along the east coast of Melville Peninsula, and it is possible that the increased hunting due to the presence of the DEW Line as well as the heavy traffic along this coast contributed to their virtual disappearance in this area. Due to the high price paid for the skins only very few are still used locally. Though bears provide welcome extra cash when met with, they can hardly be called an important resource amenable to systematic exploitation on a larger scale. Due to their value as souvenirs, only about half of the skins traded are sold to the Hudson's Bay Company. The rest are bought by DEW Line personnel, local whites and visitors.

Other Land Mammals: The number and distribution of Wolves in the survey area seem to be subject to considerable fluctuations. Parry and Lyon reported them in 1824 to be numerous and troublesome. Manning noted in 1943 that wolves were very scarce on eastern Melville Peninsula. In 1953, Loughrey reported that one skin had been traded that year and two the previous year. He doubted whether they were still breeding on Melville Peninsula. In 1962, a definite increase in the wolf population was reported, probably connected with the increase in caribou. Eskimos complained that the wolves were destroying trapped foxes. Only five hides were traded but a total of 25 animals were reported killed. All were well fed. From some DEW Line sites in the area, wolves were reported to be scrounging for food in the garbage dumps and to be getting bolder. During the 1964/65 season, five wolves were shot and eleven more seen on Baffin Island from Murray Maxwell Bay to Longstaff Bluff. Another one was found dead at Mary River after drinking some battery acid. Eskimos hunting and trapping found numerous wolf tracks throughout the area as far inland as Neergaard Lake. In the Grant-Suttie Bay area, wolves were reported to have damaged trap-lines. On Melville Peninsula two tracks were seen about 100 miles south of Hall Beach during that season. No dens were reported anywhere in the region. If the increase in the caribou population of the area continues, it may be assumed that the

number of wolves in the area will also continue to increase. Wolves are of no great economic importance to the Eskimos. Neither has any adverse effect of their presence upon the caribou population been established and the damage to traplines seems negligible. The institution of control measures at this stage, therefore, seems unnecessary.

Wolverine bones were seen in the area by Parry's party but no tracks or animals encountered. According to Freuchen several tracks were seen by members of the 5th Thule Expedition, and Freuchen assumed that wolverines had reached the region only around the turn of the century. Manning reported the wolverines to be plentiful on West Baffin Island in 1938. In 1953 Loughrey reported one from around Igloolik and one from Hooper Inlet. In the course of the survey wolverine tracks were seen in June 1965 near the end of Quilliam Bay and on the ice crossing Fury and Hecla Strait. Some Eskimos from Igloolik were quite voluble in their complaints regarding wolverines destroying trapped foxes and reported incredibly high losses. It was felt, however, that these reports on the numbers and destructiveness of the wolverines lacked credibility. No dens were reported in the area. A few weasels (ermine) are occasionally taken in fox traps - in 1964/65 only three skins were traded at the store. Weasels seem to be quite scarce and the Eskimos do not set traps especially for them since the price of the skins is too low (less than \$1.00 in 1964/65).

Rabbits are plentiful in the region, particularly in the higher rocky interior parts. They are taken by the Eskimo to vary their menu, but no special effort is made in hunting them. In 1961/62 an estimated total of 50 were taken. During the survey some were encountered on the Baffin Island side of Fury and Hecla Strait.

Ground squirrels are quite common in the Repulse Bay area but become scarcer further north. In 1953 Loughrey reported seeing colonies of ground squirrels in the Foster Bay, Richards Bay and Garry Bay areas. The squirrels are usually not hunted.

Two species of lemming are found in the area. As elsewhere, their main function is to serve as fox food but no spectacular peaks in their population density have been reported from the area. When mentioned in reports, they are generally referred to as scarce. None were seen in the course of the survey.

There is some controversy as to whether musk-oxen ever lived on Melville Peninsula or Baffin Island. There are none there now although there are considerable areas that offer an attractive habitat. It is generally assumed that Eskimos of the Repulse Bay area formed an effective barrier against their migration southwards across the Rae Isthmus. Musk-oxen had earlier been reported along the west coast of Hudson Bay, even in its northern parts and quite recently they were reported to be in the Adelaide Peninsula area. Their introduction into the area might appear as a possibility to increase the availability of protein - producers as well



as provide a source of quite valuable wool, were it not for the practical difficulties due to their slow rate of reproduction and the impossibility to effectively enforce protection in the early stages of such a project, as well as other problems which rule it out as a short term possibility. It has to be remembered that even in the long run musk-ox utilization could never be as intensive as that of some other North American ungulates, due to the biological characteristics of the species (late maturity, low reproductive rate) and to the production and nutritive value of food, particularly during winter, on potential musk-ox ranges in the area.

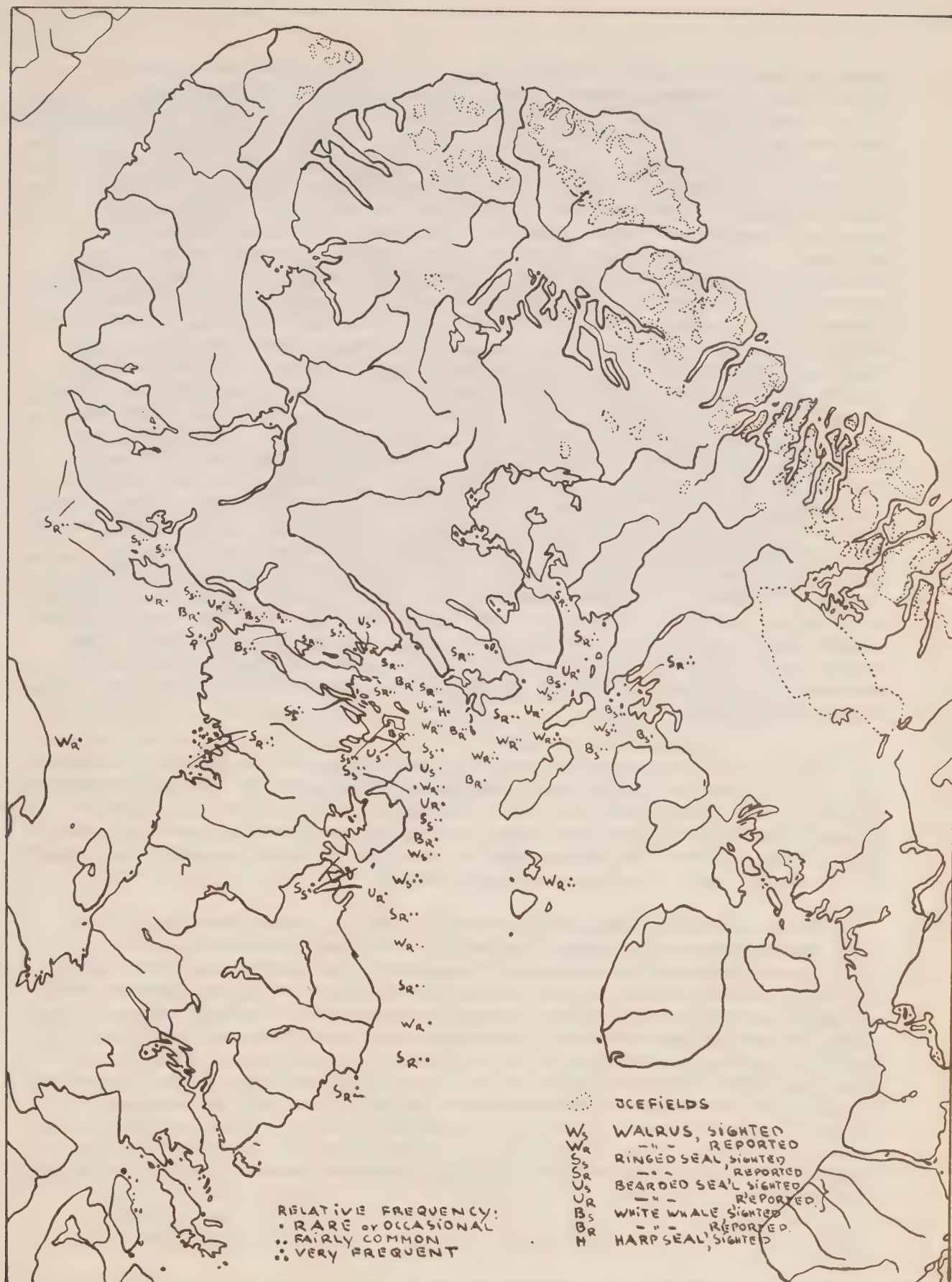
### Sea Mammals

Seal: In the survey area the present distribution of the species of seal known to occur may be roughly characterized as follows: the Ringed or Jar Seal is plentiful in most localities; the Bearded Seal is numerous in some; the Harp-Seal, though rare, is sighted regularly in north-western Foxe Basin; and Ranger Seal have been seen occasionally.

There are no detailed studies available on the number of seals or distribution in the area and historical references are scanty. In 1943 Manning reported Ringed Seal were evenly distributed along the coast of Melville Peninsula and Bearded Seal as being numerous. He did not hear of any Harp Seals north of Frozen Strait but he shot two Ranger Seals and saw several more at the floe edge off Cape Fullerton. In 1953 Loughrey reported that about 95 per cent of the seals taken in the Igloolik area were Ringed Seals. They were more frequently hunted along the floe edge than at their breathing holes. He estimated that the average hunter takes 50 to 60 annually but that some killed as many as 150 under favourable conditions and he extrapolates from that an annual take of 3,750 to 4,500 for the area. Loughrey's estimate of Bearded Seals taken annually in the area was 30 to 50. In 1962 Wight estimated a kill of 2,000 Ringed Seal for the past season, of which 800 skins were traded, 120 bought locally, 69 sent out for craft work and about 70 used locally so just over half the skins were utilized.

During the 1964/65 season the Hudson's Bay Company store at Igloolik traded 3,914 Ringed Seal skins, of which 2,888 were Common Jars at an average price of \$9.39 and 1,026 Silver Jars at \$18.68, as well as 74 Bearded Seal skins at an average price of \$20.20. This would indicate a total kill for the twelve month period of about 150 Bearded Seals as the skins of about half the number killed were used locally for traces, whips, clothing, etc. The number of Ringed Seals killed probably exceeds 5,000 for the period as some of the animals killed sink before they can be secured and some of the skins of Common Jars killed for meat are quite often discarded at present low prices particularly during extended dog-team trips.

In the course of the survey it became apparent that Ringed Seal population density and degree of utilization varied considerably throughout the area. An attempt was made to estimate the numbers of seals per square mile where it was possible to make a fair number of observations; for some other areas, population densities were inferred from reports by Eskimos. Estimates from own observations and inferred estimates are distinguished as shown (See Map 5). Highest



MAP 5: SEA-MAMMAL DISTRIBUTION IN SURVEY AREA.



observed densities occur in the western part of Fury and Hecla Strait where hunting pressure seems to be relatively light. Further west, in the areas hunted over more intensively by the Agu Bay people, Ringed Seal are still plentiful and there seems to be no over-exploitation. Little can be said about the degree of utilization in the eastern end of Fury and Hecla Strait. In the area between Sevigny Point and Igloolik Island, seals are presumed to be plentiful but bad ice conditions make detailed observation almost impossible and make travelling and hunting difficult. In Richards and Quilliam Bays, however, where the ice is generally smoother, seals are still numerous although this area is hunted over quite intensively by Igloolik Eskimos. Continuing to the south, Hooper Inlet and Foster Bay are possibly over-hunted and along the straight stretches of coast between Igloolik and Hall Beach where there is little fast ice, Ringed Seals - though frequently met on canoe trips and hunted by the Eskimos mostly along the floe edge - are not as plentiful as in the frozen bays. South of Hall Beach, seals are again numerous in Parry Bay and although this area is hunted over intensively by the people from the South Camp, there seems to be no danger of over-exploitation. Eskimo reports had to be relied on for the density in northeastern Foxe Basin. On a canoe trip from Igloolik to the Calthorpe Islands by the survey team, however, Ringed Seals were seen frequently in the water, particularly between Tern Island and Tangle Island. Kapuevik Eskimos report seals usually plentiful in Murray Maxwell Bay and in the bays cutting into Jens Munk Island. It should be noted, however, that these people, when well supplied with walrus, usually cut down on their seal hunting. Eskimos from Iglugjuak report seals to be quite numerous in Steensby Inlet and Grant Suttie Bay. One informant mentioned that in some places there are just as many as in western Fury and Hecla Strait. Annual kill is apparently nowhere near the maximum sustainable yield.

For the area as a whole then, a picture emerges of a generally dense and largely under-exploited seal population. A degree of optimal exploitation is reached and even perhaps slightly exceeded in only a few small areas. There seems to be little doubt that over the whole area not only the total take of Ringed Seal but also the efficiency of hunting could be markedly increased by the wider use of seal nets and seal hooks.

Bearded Seals or Square Flippers are usually hunted along the floe edge and most are taken along the Melville Peninsula coast from south of Igloolik although the seals appear throughout the survey area. Not being as gregarious an animal as the Ringed Seal and on the whole rarer and more sporadic in their distribution, it may be assumed that though numbers taken annually may increase with an increased use of canoes and outboard motors, such an increase will not be of a magnitude to affect significantly the local economy. Harp Seals are of no economic significance. Their apparent increase in recent years is almost certainly due entirely to increased intensity of observation. During a canoe trip in the course of the survey, four seals were sighted in open water approximately 15 miles south of Tern Island. Similarly, the Ranger Seal will continue to be primarily of zoological interest.

Walrus: Although far fewer walrus are killed per year in the area than seals, the walrus, due to its size, still represents for the majority of Eskimos, with the exception of those at Agu Bay, the most important source of meat. Appendix I gives a comparison of some estimated country food values by species, summed for the whole Igloolik region for one year.

Manning, in 1943, reported walrus to be numerous in the Igloolik region and relatively scarce along the straight stretch of coast north of Cape Wilson and entirely absent from Committee Bay.

Loughrey, in 1953, stressed the importance of the walrus for the economy of the region and that northern Foxe Basin is the only area where they can be taken in considerable numbers throughout most of the year. He found some walrus along the east coast of Melville Peninsula during the summer and suggested that the walrus might spend the summer in the area of the Spicer Islands, moving towards the coast again about the first week in October, when shore ice begins to form. At this time, he estimated the average annual kill to be about 425 including losses, going up to 500 in some years. These figures apparently exclude the Iglugjuak camp. There was practically no ivory carving; tusks sold at 50 cents per pound and he reported that in 1952, 1,200 pounds of ivory were shipped to Lake Harbour for carving.

Wight in the 1962 Game Report again stressed the importance of walrus as the main source of food and he reported that 700 was an average yearly catch. At that time, there were already a fair number of boats available at Igloolik which, together with the considerable concentration of animals, led to some indiscriminate shooting. It was suspected that some hunters were after ivory alone, as it proved difficult to control the direct sales to DEW Line personnel.

During the course of the survey, observations in camps visited, talks with hunters and camp bosses, and observations of walrus from canoe as well as from the air led to the following conclusions:

- 1) The average yearly catch now seems to be between 500 and 600 and in recent years there has been no noticeable decrease in the walrus population of northern Foxe Basin. This indicates that hunting pressure is not yet excessive, and the total kill - including losses of hunters, death from natural causes, accidents and predators - may be assumed to be at least 700 animals per year. By working backwards from Loughrey's average annual increment rate of 15 per cent per year, it may be supposed that there is a total walrus population of at least 4,700 in northern Foxe Basin.
- 2) Although some walrus remain in the Foster Bay area throughout the year and an occasional one is still killed during the summer while hauled out on the rocks of North Uglit, they now are undoubtedly less frequent along the Melville Peninsula coast between Hall Beach



and Igloolik than they used to be. This is not only attributed to the excessive hunting in the area but also to the heavy outboard motor traffic in the area and many animals, undoubtedly, just moved further out. Reports from residents and observations from the air indicate that there is a large summer population in the Koch-Rowley-Bray Island areas where some ice remains throughout the summer. There have been occasional reports of walrus from Crown Prince Frederick Island. Several years back a walrus was shot on the Committee Bay coast of Simpson Peninsula, but these walrus are probably strays from Lancaster Sound.

- 3) Although present hunting pressure does not seem to be excessive, available information does not justify recommending a substantial increase in average annual kills. In fact, it seems desirable to keep the annual kill well below the maximum sustainable yield so that the Foxe Basin population might serve as a reservoir from which some of the more southerly areas, that were massively over-exploited during the past 200 years, may be slowly re-populated.
- 4) Considering the points made above, it seems of greatest importance that all possibilities of improving utilization of walrus, without increasing annual kill, be fully taken advantage of. These possibilities include for Igloolik and Hall Beach the provision of freezer facilities and the substitution of well organized and supervised community hunts utilizing the larger boats in place of the present individual hunts by canoe. For large hunts the availability of sufficient harpoons and floats should be stressed. The Kapuevik camp has a sufficient number of whale boats but a frost cellar might be provided on Qaersuit. The South Camp and Iglugjuak should each have an additional whale boat or longliner with block and tackle to handle the heavy pieces of carcass and each should have a frost cellar at some location of their choice.
- 5) A detailed census by the Arctic Unit of the Fisheries Research Board should be suggested.

Whales: Greenland whales were once numerous at Repulse Bay and Roes Welcome Sound and - by the evidence of the old Thule ruins - further north probably throughout Foxe Basin, but were virtually exterminated during the last century by whalers. Some whalers sailed far up the Melville Peninsula coast, but there is no evidence of them having reached Igloolik. The last Greenland Whale was killed and secured by Eskimos at Lyon Inlet in 1940 and a small one previous to that in 1923. During the last few years, there were a few isolated sightings by Eskimos from the Agu Bay Camp which indicates that the whales are slowly coming back into the area.

Narwhales are not common in Foxe Basin either. Manning reported that

they are said to occur in Frozen Strait and perhaps at Igloolik and Lyon mentioned that he had seen Narwhal bones used in the walls of a sod house. Several whales possibly come occasionally through Fury and Hecla Strait from Lancaster Sound via the Gulf of Boothia. Killer Whales do not seem to occur in Foxe Basin.

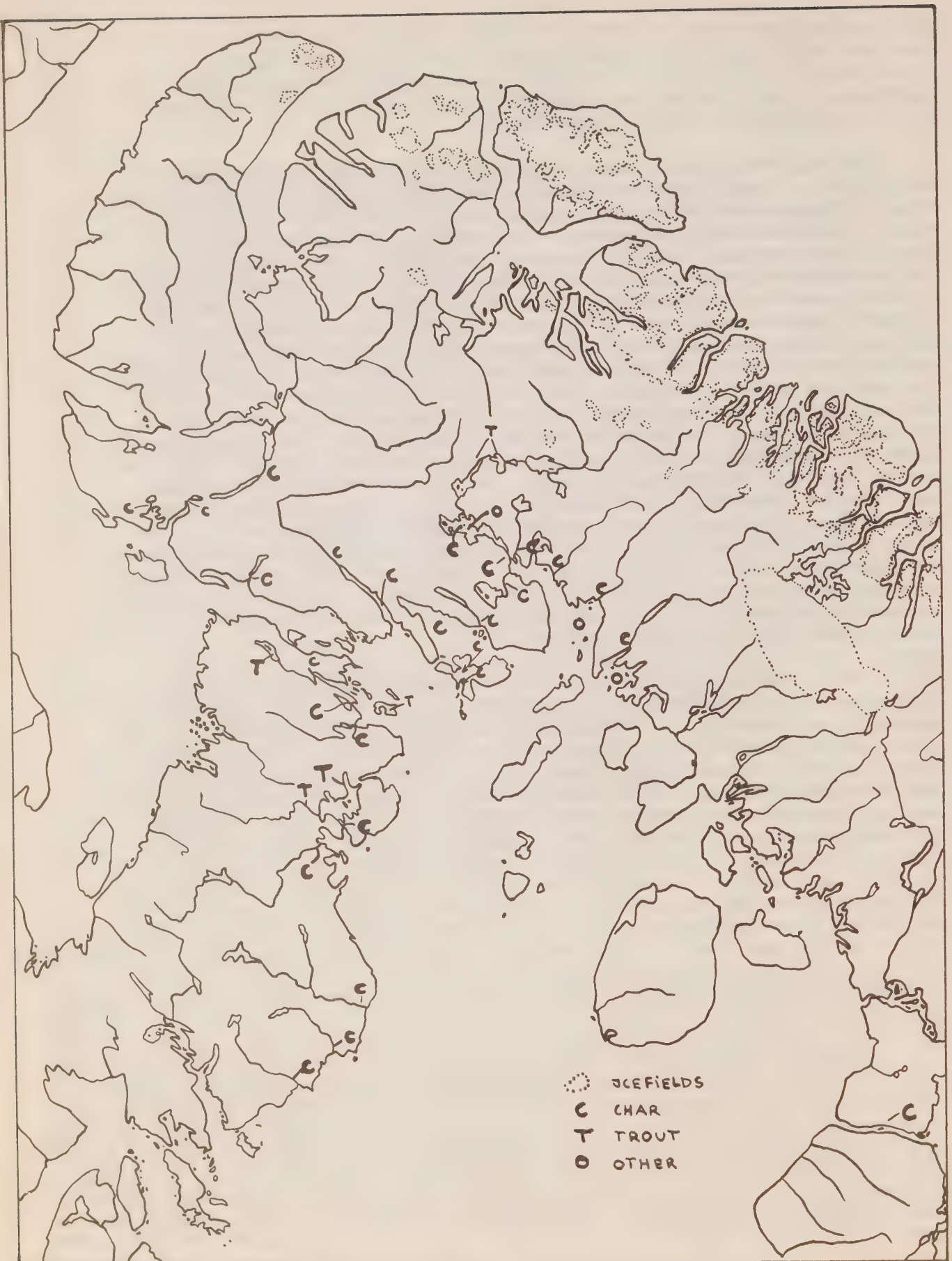
The only whale of any economic importance today is the White or Beluga Whale. Parry reported seeing large numbers in Fury and Hecla Strait. Manning did not see any whales north of the mouth of the Barrow River. In recent years the annual take has been between 20 and 30. About two-thirds were taken by Eskimos from Igloolik and the rest by the people from Jens Munk Island. During August and September the whales migrate eastwards through Fury and Hecla Strait and some pass close to Igloolik Island, even entering Turton Bay. Their hunt is always one of the big local events. During the survey many were seen from the air in the western part of Fury and Hecla Strait, most of them in groups of 6 to 15. One group of about 10 seemed to have been caught among grounded ice floes and would have been "easy pickings" for some hunters from Agu Bay had members of this camp had a large boat available in the area. There is little doubt that White Whales could be hunted very effectively in the western end of the straits. The catch every year of a larger number by the Agu Bay people would constitute an important broadening of their resource base. Their present catch - with only one canoe and one skiff available to the group - is very small and unreliable. The desirability of stationing a larger boat and providing a frost cellar in the area, perhaps at Dybbol Harbour, became obvious while visiting the Agu Bay Camp. It should be noted, however, that nowhere in the region do White Whales occur in sufficient numbers to warrant establishment of a commercial operation.

### Fish

Due to the easy availability of sea mammals throughout the region, fish play only a subordinate and supplementary role in the diet of the Igloolik Eskimos or of their dogs. Though there are numerous rivers and lakes, none seem to carry outstandingly large resident fish populations nor seasonal runs. Among the fish that are caught locally, char is by far the most important and each settlement or camp in the area frequents a number of rivers during the seasonal char runs. The fish camps are usually located close to the sea. In the Parry Bay area and south of it several large river systems are blocked for char by falls close to their mouths. On Baffin Island some rivers carry so much silt that the resulting opacity greatly inhibits the growth of photoplankton. The people of the region do not follow a systematic pattern in their fishing activities - some groups break up for a while in order to be able to fish several rivers at the same time. At the mouths of some rivers several groups may congregate to fish and in some sub-areas there seems to prevail an informal system of "crop-rotation", with fishing activity shifting between several river mouths from year to year.

In the Parry Bay area the Eskimos from the South Camp fish irregularly all rivers from the one a few miles south of Cape Jermain on northwards. Only the Ikerasak River, flowing out of Hall Lake, carries a substantial run and is fished every year. It seems, however, that the run is not big enough to justify a commercial fishery. Further north, the rivers flowing into Mogg Bay and Quilliam Bay are fished for char by the people from Igloolik and occasionally by people from Hall Beach and Napakut. Yield from both rivers varies considerably from year to year, though this may be due more to variations in effort rather than numbers of fish. In all years, the catch seems to be sufficient for local needs.





MAP 6: LOCATION OF FISHING ACTIVITIES IN SURVEY AREA.

No significant streams flow into Fury and Hecla Strait proper. There are, however, some char in the two small streams flowing into White Inlet and Autridge Bay. These are occasionally fished by the Agu Bay people. The main source of char for this group are the short rivers flowing from Navarana Lake into Foss Fiord and from Ivisarak Lake into Nyeboe Fiord. Each year the people from Jens Munk Island get some char from Skeoch Bay and from the small freshwater lake north of it but they do most of their char fishing on the rivers flowing into Murray Maxwell Bay. It was noted, that there seems to be no fishing now on the Gifford River, and no information could be obtained regarding its char potential which would indicate that it is not too great. The lack of interest of Eskimos, however, in this river's fishing potential may largely be due to the long access along Gifford Fiord. The rivers flowing into Steensby Inlet and Grant Suttie Bay all contain char and are fished by people of the Iglugjuak group. The Ravn River - Erichsen Lake system seems to have the best char potential of the whole region. This is well known to the people from Iglugjuak and was substantiated by a short fishing test in the course of the survey. This system might well justify a more detailed investigation. Although the remoteness would almost certainly hinder the establishment of a commercial fishery under present conditions, this situation would be radically altered if a permanent mining community were established at Mary River. It is of utmost importance that if this mining operation becomes established, the details of its plans for sewage and process water treatment and disposal are thoroughly checked to prevent eventual pollution of this freshwater system. The rivers south of Grant Suttie Bay to the limit of the survey area are for the most part too small and too far from permanent camps to be of interest in this respect. The only large system consisting of Gillian Lake, Drewry River, MacDonald River, being fed from the Barnes Icecap, carries a large amount of silt. A fishing test in Gillian Lake was negative.

On Igloolik Island there are some small lake trout in Landing Lake which are occasionally taken by jigging through the ice. The numbers taken are usually small and this fishing serves more as a recreational than an economic purpose. Large lake trout have been taken from Hall Lake from Crozier River on Melville Peninsula and from the Mary River system on Baffin Island. Lake trout are no doubt in many other bodies of water in the region, but they seem to be absent in some of the larger systems in the higher interior of Melville Peninsula. At present the fish are not plentiful enough to encourage any larger scale sport fishing activity, although some artificial stimulation of the lake trout population in some lakes may eventually be justified if its utilization can be combined with other economic activities. A suggestion for further work in this direction will be given in the final chapter.

Arctic cod is quite plentiful in Turton Bay and in the spring large numbers of Igloolik children amuse themselves by jigging for the fish through cracks in the ice. Sometimes the fish caught are used as a supplementary dog food. In a few cases, Arctic cod were noticed in the cooking pots of Igloolik Eskimos, but the people seemed embarrassed and were reluctant to talk about it. This might be due to the fact that the apparent necessity to eat these small fish could be interpreted as reflecting adversely upon the competence of the head of the family. The possibility of utilizing these plentiful fish for dog food on a larger scale, perhaps mixed with otherwise discarded blubber should be investigated further.



A reliable Eskimo informant from the Iglugjuak camp reported the existence in Grant Suttie Bay of a large type of cod which is frequently caught by members of his group. Bad flying conditions prevented a check from being carried out during the survey. The same man reported the existence in Erichsen Lake of another unidentified species, also cod-like in appearance but quite small. Both these reports should be investigated when possible

### Birds

Some parts of the survey area carry during the summer months an avian fauna, incredibly rich in species and in numbers. Its importance for the local economy, however, is even less than that of fish. Ptarmigan appear sporadically throughout the survey area but have never been reported in large numbers in any locality. The Eskimos eat them as a variation in their diet but the total number taken in any year in the whole area probably does not exceed several dozen. The situation is similar in regard to the Snowy Owl. It appears throughout the area, perhaps even more evenly distributed and somewhat more plentiful than Ptarmigan, though this might be more apparent than real as the owl is, due to its size and colour easily identifiable during the summer, even at considerable distance or from low-flying aircraft. It may be as plentiful in some areas as one per square mile. Owls also are taken by the Eskimos for food on occasion, but again merely for variety. Of other land birds, only the snow-bunting is plentiful during the summer months and gyrfalcons are known to breed regularly in some locations.

Aquatic birds of many species breed in large numbers in many parts of the survey area. Many of the smaller islands contain huge colonies of nests, but no enumeration of species can here be attempted. Some Eskimos regularly collect eggs, especially of Eiderducks, and as this species is also the most hunted between Igloolik and Hall Beach - frequently for sport more than for food, even after the birds have paired off for breeding - it may be in danger of marked reduction, particularly the North Uglit colony. An attempt should be made to restrict indiscriminate shooting of unattached males and to control the collection of eggs on North Uglit since a healthy colony there may eventually permit the collection of down. Canada geese appear to breed far enough from settlements and camps not to be significantly affected by hunting and other species of ducks and geese do not seem to be under any pressure. The only other species taken in fair numbers for food in the area are King-Eiders but not to the extent that their population might be endangered. It was interesting to note that several King-Eiders shot by Eskimos in the area in the summer of 1965 had been banded in Greenland.

It is suggested that the Canadian Wildlife Service assess the possibility of systematic collection of Eiderdown in some colonies - this seems to be the only way in which the local avifauna could contribute directly to the local economy. Beyond that, it might be exploited in an indirect way as an attraction for bird watchers in a similar way as some areas rich in aquatic birds in Alaska are made the goal of special tours by the American Audubon Society.

## Chapter IV

### HISTORY AND POPULATION DISTRIBUTION

#### Prehistory\*

Among archaeological sites in the Canadian Arctic, Igloolik provides a unique record of unbroken habitation. Since the end of the last glaciation - the Würm or Wisconsin glacial which lasted from about 75,000 to 13,000 B.C. - the land in the northern Foxe Basin area has been rising continuously due to the isostatic adjustment necessitated by the removal of the weight of the ice sheet. Shortly after the row of points that now constitute the highest elevations of Igloolik Island first emerged from the sea the first human settlements were established on them. The time at which this occurred has now been fixed by radio-carbon  $C_{14}$  dating at approximately 2000 B.C. Since that time, the local people have kept shifting dwelling places closer to the shore every two or three generations as the land slowly rose. As population density never increased significantly, and since agriculture was absent and the people depended almost completely on sea-mammals, there never was any reason to go back inland. All previous habitation sites were left quite undisturbed.

The oldest site on Igloolik Island belonged to the pre-Dorset or Sarqaq culture. From it came flint scrapers, some very fine needles indicating a relatively wider use of fox furs than at later times, engravers and parts of toggle harpoons. From this site too came the oldest bow so far known from North America made of caribou antler which was radio-carbon dated at 1800 B.C. The site also yielded some bones which were determined by Danish specialists as belonging to a specie of domesticated dog, somewhat larger than today's huskies. Dogs disappeared, however, before the beginning of the Dorset culture and were re-introduced by the Thule people. It is possible that archaeological work, which is planned for areas near Kapuevik on Jens Munk Island and at Isurtauq on Cape Jensen, between Steensby Inlet and Grant Suttie Bay, where higher elevations above sea-level occur, may yield sites even older than the oldest Sarqaq site at Igloolik. (Map 7 "Archaeological sites in survey area").

Eskimo prehistory in the eastern Arctic is sub-divided into three main cultural epochs, from all of which sites have been discovered in the survey area.

#### 2000 B.C. to 800 B.C. - Pre-Dorset or Sarqaq Culture

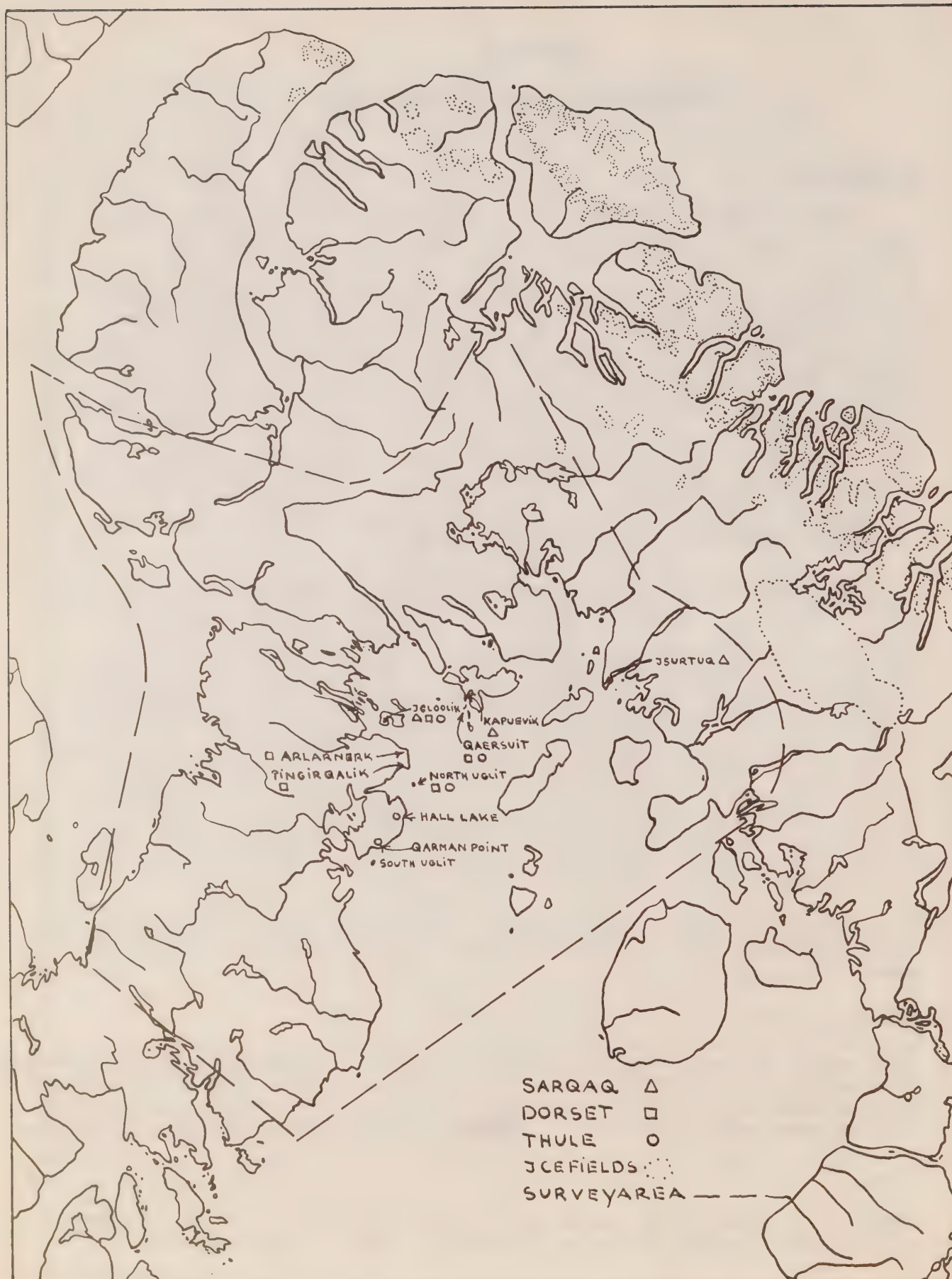
This culture is named after the settlement Sarqaq in Disko Bay where J. Meldgaard found artifacts in 1952 with similarities to Alaskan finds and Siberian Stone Age cultures. During the Sarqaq period the climate all over the Arctic appears to have been warmer and sunnier. [REDACTED] sites are characterized by round or

Sarqaq

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\*Most of the material here given was communicated orally by Mr. J. Meldgaard of the Danish National Museum at Copenhagen. See also Bibliography.





MAP 7: ARCHAEOLOGICAL SITES IN SURVEY AREA.



Figure No. 12: Excavation Site - Igloolik Island

Figure No. 13: Excavated Fireplace - Igloolik Island  
(Courtesy Mr. J. Meldgaard)





oval heavy stone tent rings with a central fireplace. The most productive sites were the ones behind the settlement on Igloolik Island and on Jens Munk Island.

### 800 B.C. to 1300 A.D. - Dorset Culture

At the beginning of the Dorset period, the climate still seems to have been relatively warm and dry, turning colder towards the end. Not only were Dorset houses rectangular in outline, but their floors were often as much as 17" below ground level and the walls were probably made of sod with skin roofs. The fireplace according to legend was in the doorway. Furthermore, the Dorset people, in many other ways, do not seem to have built on the experiences in Arctic living of their predecessors. They had no bows and arrows but hunted caribou with a spear. They had no dogs, but pulled their short sledges themselves. They started out with slate implements which were only gradually replaced again by flint, and wore long coats with high collars instead of the typical Eskimo parka with a hood. It has been suggested that their culture "smells of forest" (Meldgaard) and has parallels in late Archaic and early Woodland cultures of the southern limits of the coniferous belt. It is well established now that the Dorset people were the Tunnit of Eskimo legend. The most important Dorset sites are Abverdjar on Igloolik Island and Arlarnerk, possibly the largest archaeological site in the Canadian Arctic, on the mainland opposite Igloolik Island. The North Uglit Islands seem to have been the last refuge of the Dorset people in the area.

### 1200 A.D. to 1700 A.D. - Thule Culture

The Thule people, the direct forebears of the present-day Eskimos, left the most plentiful and impressive archaeological evidence behind them. They represent the last wave of immigrants, originating in Alaska, who, due to their superior technology and social organization, easily subjugated or exterminated their Dorset predecessors. The Thule Eskimos were primarily whale hunters who settled in relatively large villages of many-roomed houses with stone and whalebone walls and roofs, covered with sod on the outside. Many of these are still quite well preserved. The underground entry passages were built with a depression - a cold trap - a feature which was in areas of culture overlap, as for instance on Qaersuit in the Calthorpe Islands, taken over by the last Dorset people. The necessity for this feature was probably due to the fact that during Thule times the climate grew steadily colder, a trend which apparently was not reversed until the early 19th century. The Thule people brought with them the dog-sledge, bow and arrow and a much superior and highly developed implement technology. Sites are on Igloolik Island, on Qaersuit, on North Uglit, near Hall Lake, at Qarman Point and at Pingirqalik. Especially noticeable is the large stone ring on North Uglit which was apparently used for drum dances and on Qaersuit a path running along the ridge of the island and bordered by fist to head-sized stones, the origin of which is still unexplained but which was already commented upon by Parry.

There is no clearly defined dividing line between the Thule culture and the present-day population. The end of the Thule period proper is marked by the gradual disappearance of the baleen whale which forced the people to disperse from their large villages and shift more and more to walrus and seal hunting and by the beginning of the introduction of European trade goods.



Figures 14 & 15: Close-ups of Thule Ruins, Igloolik Island





## Summary of Explorations

The first visit to the Igloolik - Hall Beach area was made in 1613 by Thomas Button who sailed up Roe's Welcome Sound but assuming it to be a bay did not penetrate into Foxe Basin. Although various captains subsequently sailed up Roe's Welcome Sound and Wager Inlet and came as far as Frozen Strait, it was not until 1824 that Parry and Lyon in their ships Fury and Hecla, after visiting Repulse Bay via Foxe Channel and Frozen Strait, proceeded north along the east coast of Melville Peninsula. They mapped Gore Bay and Lyon Inlet and after wintering near Cape Fisher on Winter Island proceeded to Fury and Hecla Strait which was blocked by solid ice. They spent the winter at Igloolik, frozen in in Turton Bay and when in the following year Fury and Hecla Strait still could not be penetrated, Parry returned out of consideration for the health of his crew and judged the strait to be impassable.

In 1846-50 and 1853-54 Rae made two trips into the area - both in search of the Franklin expedition - during the first of which he mapped the west coast of Melville Peninsula as far as Cape Crozier.

In 1863 Hall travelled from Wager Inlet to Igloolik, moving overland from the head of Lyon Inlet to the Jenness River. During the second half of the 19th Century whalers occasionally penetrated into Foxe Basin but were usually quite uncommunicative about their journeys, the one exception being Captain Spicer of the "Era" who in 1879 reported on the existence of the Spicer Islands. Though Boas (1883) and Hantzsch worked primarily in districts south-east of the survey area on Baffin Island, some of their material is of interest in regard to Eskimo activities in the Piling Bay and Steensby Inlet areas (see following chapter). This brings us up to the last two expeditions that did systematic and very fruitful work in the area - the 5th Thule expedition 1921-24 under Rasmussen, Freuchen and Matthiassen and the British Canadian Arctic Expedition 1937-40.

During the course of the 5th Thule expedition, Therkel Matthiassen and Peter Freuchen made several sledge journeys from Danish Island into the Igloolik area. In the spring of 1922 they set out together on a sledge journey along the east coast of Melville Peninsula to Igloolik. There they split up, Freuchen to map the coast of Fury and Hecla Strait, going past Cape Hallowell into Nyeboe and Foss Fiords before turning back while Matthiassen went north via Cape Griffith and Gifford Fiord to Admiralty Inlet. After they met at Igloolik they returned to Danish Island the way they had come. In the spring of 1923 Matthiassen made another sledge journey to Igloolik and continued via Murray Maxwell Bay and Manertoq to Cape Thalbitzer and through Steensby Inlet and past Nina Bang Lake and Milne Inlet to Pond Inlet. Peter Freuchen in 1924 went again via Igloolik, Murray Maxwell Bay, Taser Lake and Milne Inlet to Ponds in his attempt to cross over to Greenland by dog team.

The most important journey within the survey area, of the British-Canadian Arctic Expeditions was the one from Grant Suttie Bay to the head of Cambridge Fiord.

## Recent Settlement Sites and Population Movements

The Eskimo tribes originally inhabiting the area have traditionally been divided into a number of sub-groups according to the location of their settlement sites. The Igloolik Eskimos occupy all of Melville Peninsula and northern Baffin Island, their area being adjoined in the west by that of the Netsilingmiut and - centered around River Clyde - by that of the Akudnermiut. The Igloolik Eskimos divide into the Tununermiut, centered around Pond Inlet, to whom are counted also the further sub-group of the Tununerusermiut of Admiralty Inlet; the Iglulingmiut proper, centred around Igloolik Island; and the Aivilingmiut in the Repulse Bay - Chesterfield region. There are fairly close relationships between the Tununermiut and the Akudnermiut and some between the Aivilingmiut and the Netsilingmiut, though on the whole the members of the Igloolik group tend to look down upon the latter. Some authorities referred to the Amitjormiut as a separate sub-group, living between the Iglulingmiut and the Aivilingmiut. But this group, which has its main camp at Ussuadjuk can now hardly be considered as separate from the Iglulingmiut. The same applies, though perhaps to a lesser extent, to the Kangerdlugssuarumiut of the Steensby Inlet area (Iglugjuak) who seem to be identical to the Pilingmiut and Sagdlermiut of Boas. (See Map #8). Of all these groups, the Aivilingmiut of Repulse Bay were the first to be fairly regularly exposed to contact with white whalers and to learn their whaling methods. They were consequently dispersed widely through their employment.

Two important facts regarding group compositions and settlement sites of the Igloolik Eskimos - already mentioned by Parry, stressed again by Matthiassen and borne out in the course of the survey - are the fluidity of group membership and the mobility of even main habitation sites unless based on a white settlement. It should here be noted, though, that this latter situation is supposed to have arisen only since the disappearance of the baleen whale from northern Foxe Basin. A map giving all the recent and current settlement sites mentioned by various authorities would give a very misleading impression of population density. Each group of Eskimos had, and in the case of the outlying camps still has, different camp locations for its summer and winter activities and further usually several other choices of sites for each season. During the winter of 1822-23 when Parry wintered in Turton Bay, he figured that most of the Eskimos in the vicinity camped close to the ships. There was then no winter settlement at Amitsuk. He counted a total of 155 persons with an adult to child ratio of 2 to 1 and a female to male ratio of 1.11 to 1. At this time, their normal annual cycle, which might be taken as characteristic for the region was as follows:

In September large numbers of Eskimos congregated at Igloolik Point for whale and walrus hunting from Kayaks and on the new-formed ice. From mid-December to February most moved out onto the ice at Igloolik and Pingirqalik for maulirpuk sealing (waiting at breathing holes) and walrus hunting at the ice edge. By the end of April they changed to utoq sealing (crawling up to the seal) and began to split up. The greatest degree of dispersion was reached early in summer when the young men went after caribou on Melville Peninsula while the older ones continued seal and walrus hunting. Parry and Lyon mentioned sites at Igloolik Point; Amitsuk, Pingirqalik and North Uglit and 50 years





MAC 8. DISTRIBUTION OF ESKIMO GROUPS AND THEIR HUNTING AREAS

later Hall mentions villages at North Uglit, Igloolik Point and Tern Island.

During the early '20's Matthiassen reported a group belonging to the Aivilingmiut migrating between Ussuadjuk and Lyon Inlet. Ussuadjuk is now a seasonal campsite of the southern group of Igloolingmiut. In 1922 the group included eight families with a total of 27 persons. As the head of the group, the shaman Aua was an Igloolingmiut and his wife Orulo a Tununermiut from Admiralty Inlet. They considered themselves as belonging to the Igloolingmiut and their offspring today live in the Igloolik area. From the Parry Bay area with main sites at Amitsoq and Ignertoq he reported a camp of three families comprising ten people following a cycle almost identical to that adhered to now by the considerably larger group now referred to as the South Camp.

Matthiassen divided the population which was centred around Igloolik into two sub-groups; one sub-group consisted of six families and totalling 17 persons wintering at Pingerqalik; the other, wintering on Igloolik Island, consisted of 24 families totalling 73 persons. At Steensby Inlet with winter quarters at Manirtoq on Koch Island and summer camps at Iglugjuak, he reported four families totalling 16 persons, partly from Igloolik and partly from Pond Inlet, who had according to his informants only moved there lately. It should be noted that during that time no permanent settlements were reported in the Agu Bay and Jens Munk areas. Matthiassen estimated the total Iglulingmiut population at 143 and gave an adult to child ratio of 1.8 to 1 and a female to male ratio of 1.09 to 1.

At the time of Matthiassen's and Freuchen's visit the annual cycle was still very much as it had been a hundred years before, i.e. determined primarily by walrus hunting in fall and winter, seal hunting in spring, and caribou hunting on Melville Peninsula and Baffin Island in summer. Char fishing was usually a supplementary activity only and moreover considered as women's work.

The population distribution in the early '20's is summarized in Table II. (Main Sites underlined)



Table No. II

Population Distribution in Early '20's

<u>Winter Sites</u>	<u>Summer Sites</u>	<u>Families</u>	<u>Persons</u>
<u>Ussuadjuk</u> , Qajurfik, Pt. Elizabeth	<u>Ussuadjuk</u> , Adderley Bluff, Lyon Inlet	8	27
<u>Amitsuq</u> , Ignertoq, Anangiarssuk, Umiarfik	<u>Ignertoq</u> , Amitsoq Kingatjuaq	3	10
<u>Pingerqalik</u> , Alarnang	<u>Qupersortuaq</u> ; Arversiorvik, Pingerqalik, Alarnang	6	17
<u>Iglulik</u> , Qiqiqtadjuq	<u>Apatdleq</u> ; Ungerlodjan; Sarbaq, Eqaluit, Ignerit	24	73
<u>Manirtog</u>	<u>Iglugjuak</u>	4	16
<u>Total</u>		45	143

The stories of some individuals may perhaps serve to illustrate the extent of the movements between the various Eskimo groups, prior to the establishment of permanent white settlements, which greatly increased population movements. Orulu, the Eskimo woman mentioned before, whose son Uyarak still plays an important role in village affairs at Igloolik, was born at Admiralty Inlet (about 1875). From there her family moved to Igloolik, then to Piling Bay and probably up the Baffin east coast and back to Pond and Admiralty Inlets, where she married Aua. With him she moved to Repulse where the family stayed until Uyarak grew up who, in his turn, went to live for a while at Admiralty Inlet before settling at Igloolik.

About 1880 a group of Eskimos from Pond Inlet tried to migrate to Foxe Basin, but were caught up in deep, fresh snow in central Baffin Island and all but one woman who resorted to cannibalism died of starvation. When found by a wandering group of Eskimos, the woman was taken to Igloolik where eventually she became an important leader in the community.

Around 1900 an old Shaman, Inernerunashuag, from Pelly Bay and a hunter, Arnarjuag, from Back River or King William land moved in with the Aivilingmiut and Amitjormiut groups.

## Chapter V

### CURRENT SETTLEMENTS AND POPULATION DISTRIBUTION

The current settlements in the Igloolik area may be divided into three distinct types: (A) Fairly traditional. These are small communities adhering to a subsistence hunting and fishing economy. This group would include the Agu Bay camp, the South Camp, the Jens Munk camp and the Iglugjuak camp. In order to keep the classification simple, Qiqigtadjuk and Naujaguluit might be included here though their dependence upon the main settlement of Igloolik is somewhat greater. (B) Communities largely dependent upon a permanent white establishment. In addition to Igloolik and Hall Beach this group may include the Eskimo families supported by full-time steady employment of the head of the family at a DEW line site. (C) Napakut should be classified by itself as a predominantly parasitic community, dependent largely upon Hall Beach. To some extent it engages in traditional hunting and fishing activities. (One might argue that Naujaguluit should come under the same heading). Below, the individual communities will be described in detail.

#### The Agu Bay Group

This is probably the most recently formed of the distinct local groupings. It originated about 1940 with the arrival in the region of a small group from Arctic Bay, where hunting had for some time been quite bad. This nucleus was joined by other families from Igloolik and the group as it now exists has close kinship ties with Arctic Bay, Igloolik and Iglugjuak. The group now consists of six families with a total of 31 persons, all of whom are Anglican. There are nine girls and eight boys under sixteen years of age and five female and nine male adults above that age. The group does not include any old-age pensioners nor any disabled persons. The amount of social assistance payments required by them has in the past been quite negligible.

When this group was visited early in June, 1965 they were camped at Point Kendall, the easternmost tip of Crown Prince Frederick Island though one family of five members had left a few days previous to spend the summer at Encampment Bay. The camp appeared prosperous and neat and the influence of a competent and dynamic camp boss was clearly evident. Although shortest of all camps in capital goods, it is the most self-sufficient in spite of the fact that its hunting area is entirely lacking in walrus. The group is highly mobile during the winter - each of the six families has its own dog team. Only one family possesses a canoe with an outboard motor and there is a frail skiff - sealskin over a wooden frame. This lack of boats makes it impossible for the group to exploit optimately the white whale migration through Fury and Hecla Strait early in August. In winter, members of the group travel up the Gulf of Boothia



TABLE III :

## BREAKDOWN OF POPULATION DATA BY SETTLEMENTS.

SETTLEMENT	Family Units	Persons	Female	Male	Ratio F/M	Girls <16	Boys <16	Tot Chil. <16	Ratio Ad/Ch	>65 M F	Religion A C	Dog Teams	Canoes	Outb. Motors	Skidoos	Other Boats
IGLOOLIK	49	229	111	118	.94/1	58	65	123	.86/1	4 1	100 129	21	10	16	7	1 trap & eng 2 whale & acadia 1 whale, no mot.
HALL BEACH (exl. DEW site)	14	65	28	37	.76/1	16	17	33	.97/1		39 26	5	6	7		1 whale with sails
ALL DEW SITES	12	61	30	31	.97/1	18	16	34	.79/1		48 13	-	2	1		1 launch & motor
SOUTH CAMP ✓	7	44	21	23	.91/1	12	12	24	.83/1		44 -	7	2	3		1 trap on order
NAPAKUT	13	56	25	31	.81/1	13	14	27	1.07/1	2 1	31 25	7	6	5		1 trap & acadia
QIQIQTADJUK	13	60	29	31	.94/1	16	13	29	1.07/1		- 60	9	3	4		1 whale with sails
AGU BAY ✓	6	31	14	17	.82/1	9	8	17	.82/1		31 -	6	2	2		
NAUJAGULUIT	2	12	6	6	1/1	4	3	7	.71/1		12 -	2	1	1		
KAPUEVIK	9	37	14	23	.61/1	7	12	19	.95/1		37 -	7	3	4	1	1 trap & acadia 1 whale with sail
IGLUGJUAQ	9	47	20	27	.74/1	10	16	26	.81/1		47 -	9	3	1		1 whale & acadia (very old)
TOTAL	134	542	298	344	.867/1	163	176	339	.895/1	6 2	389 253	73	38	44	8	8 large boats with motor and 4 without.
											60.5 % 39.4 %					

coast of Baffin Island as far as Bernier Bay hunting for polar bear. Polar bear skins are one of their most important sources of cash. Seal hunting is excellent in the western part of Fury and Hecla Strait - from Ormonde Island and Sikosak Bay to Nyeboe and Foss Fiords. In fact this area is probably the richest in seals in the whole region. The group does not do too much caribou hunting. These animals are not plentiful in the area; what caribou hunting there is does take place in the northwest corner of Melville Peninsula (Brevoort River Area) and on Baffin Island north of Autridge Bay. The group fish for char in a number of small streams on Baffin Island, the best ones being the two emptying out of Ivisarak Lake and Navarana Lake. None of the river systems would be able to support a very extensive fishery.

The two main camping areas where most of the members of the group camp together for a considerable time are at Agu Bay, the cape at the western shore of the entrance to Nyeboe Fiord and the south-eastern coast of Crown Prince Frederick Island from Point Kendall to about 12 miles west of it. Tents or igloos are used, the members of this group have so far not started to put up shacks. Through most of the year, individual families or impermanent sub-groups occupy a wide variety of temporary camp sites. The most frequently occupied are those at the mouths of the rivers flowing from Navarana and Ivisarak Lakes at Dybbol Harbour, off Cape Hallowell, at Sikosak Bay, on Ormonde, Liddon and Amherst Islands and on the Baffin Island coast opposite the latter, at East Cape, Encampment Bay and Garry Bay. Not all of them are, however, occupied every year.

To sum up, this group is quite self-sufficient and well led and the area it hunts over could possibly support a considerably larger group. The stationing of a whale boat at the western entrance to Fury and Hecla Strait would enable them to exploit the annual white whale migration better. Seal and whale meat and oil storage facilities could be improved by building a frost cellar, perhaps at Dybbol Harbour.

### The South Camp

The people of what is here called the South Camp may be considered the descendants of the Amitjormiut sub-group although, of course, they include migrants from other districts. In any case, they occupy the same area. In previous accounts, a number of separate villages were distinguished: Ussuakjuk, Tikirak, Ingnirtuk and Qarmat being the most important ones. After visiting the families living in this area at the end of June, 1965, it seemed to be preferable to consider them as members of one group with a changing pattern of local and social sub-divisions. The group has kinship ties with Repulse Bay, Igloolik and Kapueevik, and consists at present of seven families totalling 44 individuals. It should be noted that some people included at the time of the survey - perhaps



a bit arbitrarily - in the Hall Beach and Napacoot groups, pay on occasion extended visits to camp sites of this group. All members of the group are Anglican. There are 12 girls and 12 boys under 16 years of age and nine women and 11 men above that age. The oldest member of the group, a widower of 62, is drawing a disability pension. Both his feet were crippled by frost. He is, however, still capable of handling a dog team and does most of the "Shopping trips" to Igloolik. A problem in the group which should merit some special study is the presence of a number of people with congenital defects. The group has seven dog teams, two canoes and three outboard motors. The camp boss lost one whale boat with an Acadia motor but has a new trapboat on order which should be delivered shortly. This man, an energetic and cheerful leader, has also been instrumental in introducing the use of seal-nets, which seem to be catching on quite well. When visited, one family was camped about three miles west of Qarman Point, two families on the narrow spit of land due east from south Uglit and the other four at Ingnirtuq Point. Camp locations of this group and family dispersion are determined according to season by their hunting activities. As this group depends largely on walrus hunting, this means by the position of the ice edge. The fact that the bulk of the group was camped at Ingnirtuq instead of Ussuadjuk was probably due to the loss of their whaleboat. Ussuadjuk is in most years in a better position relative to the spring ice edge



Figure No. 16: Benjamin Arnadjuak - Camp Boss of the South Camp, checking sealskin floats

and Ingnirtuq closer to fairly good sealing on frozen-over Parry Bay. In early summer the group congregates on the north-eastern side of the Ikerasak river estuary for the char run from Hall Lake. This run is adequate for the group but is not outstanding enough to merit the establishment of a commercial fishery. To hunt caribou the group goes to Amitioke Peninsula and to some crossing places on the river flowing into Parry Bay about 15 miles west of Ingnirtuq. Some of the young men in the group occasionally obtain wage employment at Hall Beach. There is a fair amount of ivory carving and unfortunately also illegal selling of uncarved tusks, usually at a rate of \$8.00 to \$15.00 per pair. The proximity of Hall Beach, aside from providing some cash income, also led to the acquisition of a fair amount of metal, wooden, plastic and textile goods from settlement discards. Fortunately, however, the group as a whole is not dependant upon scavenging and did not modify too much their traditional way of life. Their campsites were clean and meat supply plentiful. At present, walrus meat is stored in the traditional manner under gravel mounds. Walrus hunting by canoe as done at present is, however, not only dangerous, but also relatively inefficient. Even of the walrus secured by harpoon or on an ice-floe approximately two thirds is wasted and dropped into the sea. The delivery of the trapboat should improve the situation. Much of the presently discarded carcass would still make good dog food. Also, use of sealnets might well be increased. On the whole, this area could also support a somewhat larger camp.

#### The Jens Munk Group

Although the Jens Munk Island area had been occupied continuously from pre-historic times to at least the late Thule period, nobody apparently lived there from the early 19th to close to the middle of this century. The reasons for this are not apparent and the Eskimos themselves are unable to give any. The members of the present group congregated there from Repulse Bay, Pond Inlet and Admiralty Inlet, Qiqiktadjuk and Siorarjuk. The camp consists now of nine families comprising 37 persons, all of them Anglican. There are seven girls and twelve boys under sixteen years of age and seven female and eleven male adults and no old age or disability pensioners. At the time the group was visited (middle of July '65), six persons were in hospital, most with tuberculosis. Materially, the group is well off and requires little social assistance. At the time of the visit, the group had left its winter camp at Kapuevik on Jens Munk Island and was camped at Qaersuit on the Calthorpe Islands to prepare for the walrus hunt. They usually pull up their boats at Qaersuit for winter. The group has seven dog teams. Of the two heads of families not having their own, one is a young widower without dependants who moved back in with his father, The other one, married with three children, shares all equipment of the campboss, his father. The group has three canoes, four outboard motors, one skidoo, and one trapboat with an Acadia motor and one whaleboat with sails. The group adheres to a very traditional way of life. Of interest is the



fact that the wife of the camp boss is influential in any decision affecting the welfare of the community. The group hunts walrus to the south and south-east of Jens Munk Island by boat. They hunt seal on the ice over a wide area around Jens Munk Island from Murray Maxwell Bay over Gifford Fiord to the south and east toward Rowley and Koch Islands. In spring they go char fishing, first at Skeoch Bay and the freshwater lake north of it and later at the mouths of the rivers draining into Murray Maxwell Bay. For caribou hunting they go to Baffin Island into the area between Neergaard Lake and Gifford River. Some of the younger people sometimes go into the area between Ikpiik Bay and Piling Bay, but less frequently now than formerly. In the last two years, caribou have again come across to Jens Munk Island after a long absence. There are, however, not enough to contribute substantially to the food supply. The standard of living of this group seems satisfactory. They are well led and keep a clean camp. Improvements that would contribute to their material welfare are possible and, in view of the fact that they occupy only two main sites only a few miles apart, quite feasible through provision of better storage facilities - frost cellar - and improved housing as well as introduction of sealnetting. A limited amount of collection of Eider-down could also be practical as there are large colonies on some of the smaller islands nearby. This should not be suggested to them unless there is a project officer present and until clearance is obtained from the Wildlife Service.

#### The Iglugjuak Camp

This was the one outlying camp in the region which was not visited in the course of the survey. As, however, one of its hunters accompanied us on an extended trip, it was possible to form a fair picture of its status. The Steensby Inlet area is one of the three continuously occupied population centres in the region - the other two being Igloolik Island and the South Camp area. The group probably derives from the two previously referred to as Kangerdlugsuarmit and Pilingmiut and includes the sub-groups more recently identified with the camps at Nigliviktuk, Manirtuq and Isurtuq. The size of this group as late as 1940 had been estimated at 80. Today it consists of nine families totalling 47 individuals. This decrease is probably due to the attractions of life near a white community and to the relative difficulty of access to this camp and not to a decrease in natural resources. The present population consists of ten girls and sixteen boys under the age of 16, and ten female and eleven male adults. There are no old age pensioners. The head of one family draws a disability pension due to blindness and partial deafness. Social assistance requirements are low and only one woman was hospitalized. All members of the group are Anglican. Among them they own nine dog teams, three canoes, one outboard motor (in bad shape) and one very old whaleboat with Acadia motor. Another whaleboat with Acadia motor was lost the preceding season. The members of this group are somewhat more mobile than the Jens Munk people but do not disperse as widely as the South or Agu Bay camps. Besides Iglugjuak itself - near Cape Thalbitzer - they use the following main campsites: Manirtuq on Maneetok Island, north of Koch

Island; Isurtuq at Cape Jensen; and Eesuuktuk at Ignerit Point, which forms the southern entrance to Grant Suttie Bay. The group hunts walrus in the Rowley - Koch - Bray islands area. The walrus population in this area in late summer is high and is presumed to consist of the same herd hunted earlier in the season off Hall Beach. This herd follows the retreating ice as this area is never entirely free of floes throughout the summer. Members of this group usually hunt caribou on Baffin Island from the eastern side of Steensby Inlet down to the Piling Bay area. The seal take in winter and spring is reported to be quite adequate which is not surprising considering the broken coastline. Char fishing is good, particularly in the streams draining the larger lakes in the area. Again, no outstanding large runs occur in any of them that would, at this stage, warrant establishment of commercial fish camps. In addition to char, a larger cod is fished from Grant-Suttie Bay and a relatively large number of what are presumed to be a type of Saffron Cod are fished in Erichsen Lake. These reports should be followed up and might warrant a special investigation by the Fisheries Research Board.

On the whole, the renewable resources of this area could probably support a larger population increment than the other sub-areas. The greatest need seems to be for additional large boats, nets, storage facilities and, again, an improved type of semi-permanent housing.

#### Naujaguluit

This group consists essentially of one family of ten including four daughters and four sons under sixteen, the oldest of whom is absent most of the year attending school at Churchill. Another young family, without children, is generally classified as belonging to that group, though they pay extended visits to other camps, most frequently the South Camp. Both families are Anglican. They both have dog teams and the large family also owns a canoe with outboard motor and all live in what is basically a 370 type house. This house was originally shipped to one of the islands in Fury and Hecla Strait, then brought to Naujaguluit, which is identical with Seigny Point, and there re-assembled without qualified supervision. The result is now a squalid shack which serves as proof of the inadvisability of putting up conventional housing outside a closely supervised settlement. Other Eskimo families that used to live in the general area have now left, the reasons given being, that the ice edge is too far in winter and spring and that ice conditions towards the south-east are unfavourable for dog team travel. The family now resident requires considerable social assistance payments. The family is looked down upon by other Eskimos, because the other Eskimos are frequently obliged to help out with food. The family hunts seals around the north-eastern part of the entrance to Fury and Hecla Strait, caribou towards the north and north-west of the camp, although there are not too many in this area, and fish some char in the rivers running into Gifford Fiord. They do some stone carving, though in a half-hearted way, wasting a lot of stone and turning out work of mediocre quality.

The area is relatively poor in resources, plagued by bad ice conditions,



and the people are not able to support themselves. For that reason, they would not be welcome in any of the outlying camps and their forced presence in any of them would constitute a constant cause of friction. This group should be moved into Igloolik and the existing shack at Naujaguluit burned.

### Qiqiqtadjuk

The site of Qiqiqtadjuk, located near the north-eastern extremity of Igloolik Island, has been occupied for a considerable time. There seems to be no evidence of pre-historic settlements. Until quite recently only three closely related families lived there. With the emergence of what used to be known as Ikpiakjuk as the main settlement on Igloolik Island, which followed the establishment of the Hudson's Bay Company post and the move of the Roman Catholic mission, and the consequent gradual abandonment of Igloolik Point - at the south-east corner of the island - as a permanent habitation site, the population of Qiqiqtadjuk increased by nearly 50 per cent within the last few years.

The population, all of whom are Catholic, consists now of 13 families totalling 60 persons. There are 16 girls and 13 boys under the age of 16 and 13 adult women and 18 adult men and no old age pensioners. Two of the men are disabled. This camp requires a fair amount of social assistance. One man particularly is very improvident and has such a bad name for scrounging that he and his family are frequently forced to camp on Neerlonakto Island.

Three 370-type houses have so far been put up at Qiqiqtadjuk, two of which are occupied by the families whose heads are disabled. Nine families have dog teams and there are three canoes in the community, four outboard motors and one whale boat equipped with sails. The hunting and fishing areas of this group coincide largely with those of the people from Igloolik. There is possibly some concentration of their activities in the eastern entrance to Fury and Hecla Straits. The former camps at Manitoq, on Richards Bay, and Kakalak, on Sikoksak Bay, and Suglagjuk in Fury and Hecla Strait were occupied by people now living at Qiqiqtadjuk. Why these outlying camps were abandoned is not quite clear and although poor hunting has been given as a reason, it is more probable that family relationships and the proximity of the white settlement at Igloolik were the determining factors. There seems to be no compelling rationale for the existence of a separate camp at Qiqiqtadjuk. As, however, the three other northern camps will not readily absorb the people there due to religious differences, eventual absorption by the main community at Igloolik seems indicated. Indeed there seems to be a strong possibility, though this has never been made explicit, that this camp constitutes an attempt by a Catholic group to gain better access to relatively underexploited hunting and fishing grounds considered to be on the whole the preserve of the three northern Anglican camps. The erection of additional permanent housing at Qiqiqtadjuk should not be considered.

## Napakut

This might be called the most controversial of the outlying camps. The location was determined by the proximity of Hall Beach and by the existence of a lagoon-like estuary of a small stream. The nucleus of the population was provided by the former camps of Qimmiqtugvik and Nugsagnarjuk. The locations of these camps are still used as temporary sites, together with Agungniq, Pingirqalik and occasionally North Uglit. Thus the camp may be identified with the Foster Bay area. Though the site is outside the range of effective administrative supervision from either Hall Beach or Igloolik, unfortunately, however, it is still within walking distance of the DEW line site and its garbage dumps; and because the site is also only a short trip from the source of social assistance at Igloolik, there settled at Napakut a number of sub-marginal hunters and their families from other areas. The requirements of the population now far exceed the renewable resources available. Even without the existence of the Napakut camp the Foster Bay area would be under excessive pressure due to the heavy travel between Igloolik and Hall Beach. The presence of motorized transportation and of numerous dog teams and the relative cheapness of ammunition coupled with lack of dependence upon game shot and an unabated hunting instinct by the wage-employed Eskimos, who carry out a large number of Igloolik-Hall Beach trips in the course of their employment, also adds to the pressure on available wildlife resources.

The population consists now of 13 families with a total of 56 members, 31 are Anglican and 25 are Roman Catholic. There are 13 girls and 14 boys under 16 years of age and 12 female and 17 male adults, and two male and one female old age pensioners. One member of the group has a trapboat with Acadia motor, for which the little lagoon serves as a harbour. Members of the group also have seven dog teams, six canoes and five outboard motors. Although some of the men are good hunters, the camp as a whole requires a considerable amount of relief and some families subsist almost completely on relief. Most of the families no longer live in tents or igloos but in plywood-cardboard, shacks and the camp makes an extremely filthy appearance as do most of the people - although they are a very friendly lot. Most of them would no longer be able to support themselves by traditional means if resources in the immediate vicinity were far more plentiful than they are. Years of scavenging have demoralized them. Even when offered temporary wage employment at the base, many of them will not bother to take it. With the closing of the base in sight, several members of this camp may have to move to the Igloolik settlement where their rehabilitation might be possible while others could move to Hall Beach. The competent hunters though should be persuaded to join some of the other self-supporting camps. In the interest of the growing generation, it seems imperative that this camp be disbanded and the existing shacks destroyed.



Igloolik

The present village of Igloolik has emerged as the predominant settlement in the region. It will as such, no doubt, govern the development of regional patterns of economic activity for some time to come. It should, however, be realized that the site it occupies, which used to be referred to by the Eskimos as Ikpiakjuk, is not one at which any large number of self-supporting Eskimo hunters would have chosen to live in order to be able to exploit to their best advantages the local resources. For that, Igloolik Point on the south-eastern corner of Igloolik Island is much better suited. This is also well supported by historical evidence. The first habitation sites on the island belonging to the Sarqaq and early Dorset culture were behind the present village. It seems that when Turton Bay developed its distinct features during the Dorset period, the Eskimos moved to locations that in winter and spring were closer to the ice edge and were less plagued by floating ice which gets bottled up for prolonged periods in Turton Bay during southerly and easterly winds. The growth of the village of Igloolik is thus entirely due to the



Figure No. 17: The Roman Catholic Church, Igloolik

establishment there of the Hudson's Bay Company post and of the Roman Catholic Mission, which had originally been established at Abadjaq, that is by decisions based on factors other than those determining traditional Eskimo life.

The permanent Eskimo population consists now (figures as of July 1, 1965) of 49 families totalling 229 persons of whom 129 are Roman Catholic and 100 are Anglican. The original tendency towards a segregation of the settlement into a Roman Catholic part, centred on the mission buildings, and an Anglican part, grouped around the Department of Northern Affairs and National Resources buildings, the two parts separated or connected by the Hudson's Bay Company post, now seems to be gradually disappearing. The population breaks down into 58 girls and 65 boys under the age of 16, 52 women and 49 men between 17 and 64, and one woman and four men over 65. In addition to the equipment owned by the co-operative, Eskimos individually own 21 dogteams, seven skidoos, ten canoes, 16 outboard motors, one trapboat with engine, two whaleboats with Acadia motors and one whaleboat without motor. There are 23 housing units in 22 buildings that can be classified as permanent which are occupied by Eskimos. This figure may be broken down as shown in Table IV.

Table IV

Types of Housing, Igloolik 1965

370 - type houses (departmental employees and welfare included)	- 9
Departmental Duplex	- 1
Hudson's Bay Company houses	- 4
Other wooden houses	- 3
Quonset huts	- 1
Stone dwelling	- 1
Shacks	- 3

During the summer of 1965, five heads of families and one young man, still living with his parents, were employed by the Department of Northern Affairs and National Resources on a regular basis. Three heads of families were employed by the Hudson's Bay Company and one worked for the duration of the exploration season at Mary River. Some of the women are frequently employed by white residents for house work. Regular wage employment of Eskimos, averaged over a twelve-month period, which in 1964 accounted for approximately 20 per cent of total money income





Figure No. 18: The Roman Catholic Mission, Igloolik

Figure No. 19: Anglican Church - Igloolik



(exclusive of welfare payments), has risen. Unfortunately, this rise in wage employment was, early in 1965, offset by a drop in fox and ringed seal fur prices. Thus the proportion of wage income rose to about 40 per cent of total income for the first four months of 1965. (See Table IX) Distribution of individual incomes from fur sales is given in the Graph No. VI. The implications of these figures will be dealt with in the chapter on economic activities. The people from Igloolik hunt seal and walrus predominantly to the south-east of the island, caribou on north-eastern Melville Peninsula and in the Ikpiik-Piling Bay area of Baffin Island and go char fishing in the rivers running into Quilliam Bay and Mogg Bay. In late summer there usually are several white whales caught as they pass Igloolik on their south-eastward migration through Fury and Hecla Strait. Fox trapping by the people of Igloolik has not declined with the fall in fox prices to quite the extent as in the outlying camps but with a few exceptions they go about it in a half-hearted way. Usually they fail to patrol their trap lines frequently enough and consequently



Figure No. 20: Beached Boats - Igloolik



loose large proportions of their catch to wolverines, The fact that the best trappers in the region averaged only 25 to 30 foxes for 1964 adequately illustrates the situation. There are some very good carvers - some of them, in fact, should be counted among the best in the whole Canadian Arctic. The local Co-operative has done an excellent job of selling carvings at relatively good prices at the Hall Beach DEW line site. This is one area where considerable expansion is possible.

On the whole, the village is now probably too large to gain an adequate livelihood from the exploitation of renewable resources

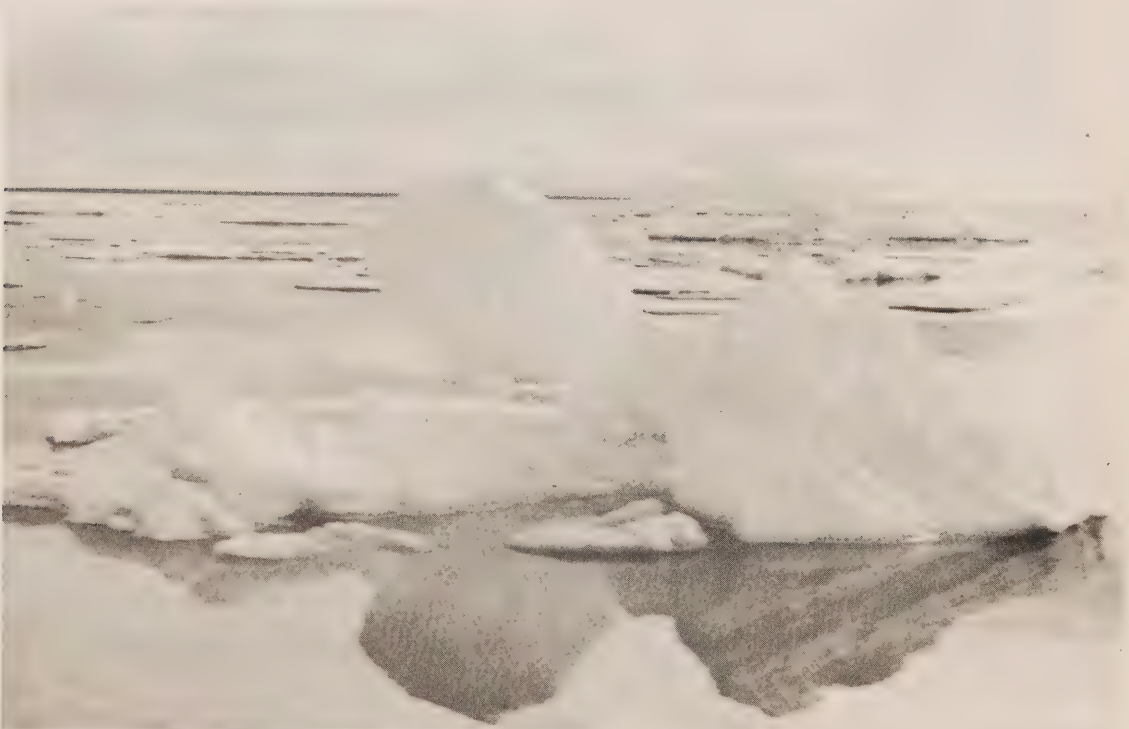


Figure No. 21: Break-up in Turton Bay

Figures No. 22 & 23 Panoramic View - Igloodlik - Summer 1965

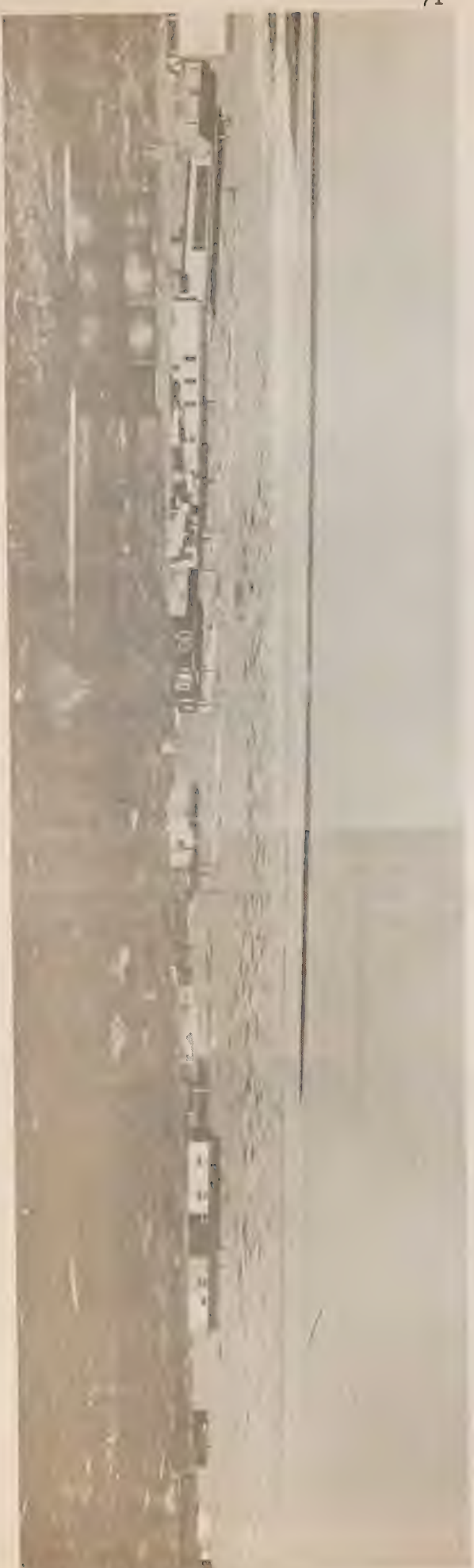






Figure No. 24: Stone Dwelling - Igloolik

Figure No. 25: Federal Day School - Igloolik





Figure No. 26: Hostels and Eskimo Tents - Igloolik

alone and dependence on the white establishment has been growing steadily. This trend has now become irreversible, but as the community lies in the midst of one of the richest areas in the north, improvements in methods of exploitation could, no doubt, bring about considerable increases in the general standard of living.



Figure No. 27: Mr. P. Kunnuk and Mr. E. Konno Skinning Polar Bear



### Hall Beach

The selection of Hall Beach for a major DEW line installation was due to its latitude, the availability of adequate fresh water supplies and the wide, easily accessible beach. Although there are ruins of some Thule houses close by, no camps were reported there in the more immediate past. Walrus hunting is fairly good just off Hall Beach - possibly due to the proximity of the Manning Islands - but the beach is rather exposed. If one were to draw a dividing line between the groups centered around Foster Bay and the South Camp in pre-DEW line days, such a line would probably run right through Hall Beach.

Hall Beach at present is really two distinct and separate communities, contact between them is incidental. One is the DEW line - airport complex, which will be dealt with in the following chapter; the other one is centered around the Department of Northern Affairs and National Resources and LNHS facilities. A gravel road connects the two communities. This latter Eskimo community now consists of 14 families totalling 65 persons of whom 39 are Anglican and 26 are Roman Catholic. There are 16 girls and 17 boys under age 16 and 12 female and 20 male adults and no old age pensioners. Members of the group own five dog teams, six canoes, seven outboard motors and one whaleboat equipped with sails. Two heads of families are employed regularly by the Department of Northern Affairs and National Resources, one by I.N.H.S., one by Nordair and one had steady employment at Mary River for the season. The percentage of regularly employed heads of families is thus relatively high and there is in addition good opportunity for occasional employment, particularly during the shipping season. This relatively high degree of dependence upon wage employment has led to some neglect of hunting and fishing activities. The people hunt seal and walrus from the ice as well as from boats off the long almost straight stretch of beach on which the settlement is built. Caribou hunting does not seem to be a regular, organized activity, but is done only occasionally. The situation is similar in regard to char fishing. Both facts may probably be blamed - in addition to the presence of the DEW line base - upon the location on an exposed coast, absence of major rivers and the virtual pre-emption of the prime resource area of Parry Bay by the South Camp and the relative over-exploitation of the Foster Bay area by Napakut as well as people from Igloolik and Hall Beach.

Since a limited white establishment at Hall Beach seems assured even after the eventual closing of the DEW line station (I.N.H.S., Nordair, D.N.A. & N.R. and possibly Bell Telephone) wage employment will continue to be available for a small number of Eskimos; not, however, significantly exceeding the number employed at present. Further growth of the present Eskimo community should now be discouraged. If suitable hunting and fishing patterns can be developed, however, the population of the South Camp might be settled at Hall Beach. The stocking of the smaller lakes to the west and south-west with lake trout combined with some artificial fertilization to guarantee substantial yields, might

deserve detailed investigation.

#### The DEW Line Sites

Of the 12 heads of families currently employed on DEW line sites in the survey area during the summer of 1965, one was located at Garry Bay (Cam 5), seven at Hall Beach (Fox Main), two on Rowley Island (Fox 1), and two at Longstaff Bluff (Fox 2). Of these 12 families totalling 61 persons, 48 are Anglican and 13 are Roman Catholic. There are 18 girls and 16 boys under age 16 and 12 female and 15 male adults and no old age or other pensioners. Four of the families were hired from the western Arctic. None of them have dog teams (DEW line ordinance), one has a car-top boat with outboard motor. Another has a canoe but no motor and still another has a launch with a heavy Mercury motor. Some of them, however, are reported to have accumulated substantial savings. Most of them have an adequate command of English and some may be considered completely acculturated. Their accommodation is provided by their employer and they live almost exclusively of their wages. They do hunt and fish a little in their spare time. There seems to be little doubt that these people will be able to find other wage employment when the DEW line installations are closed,



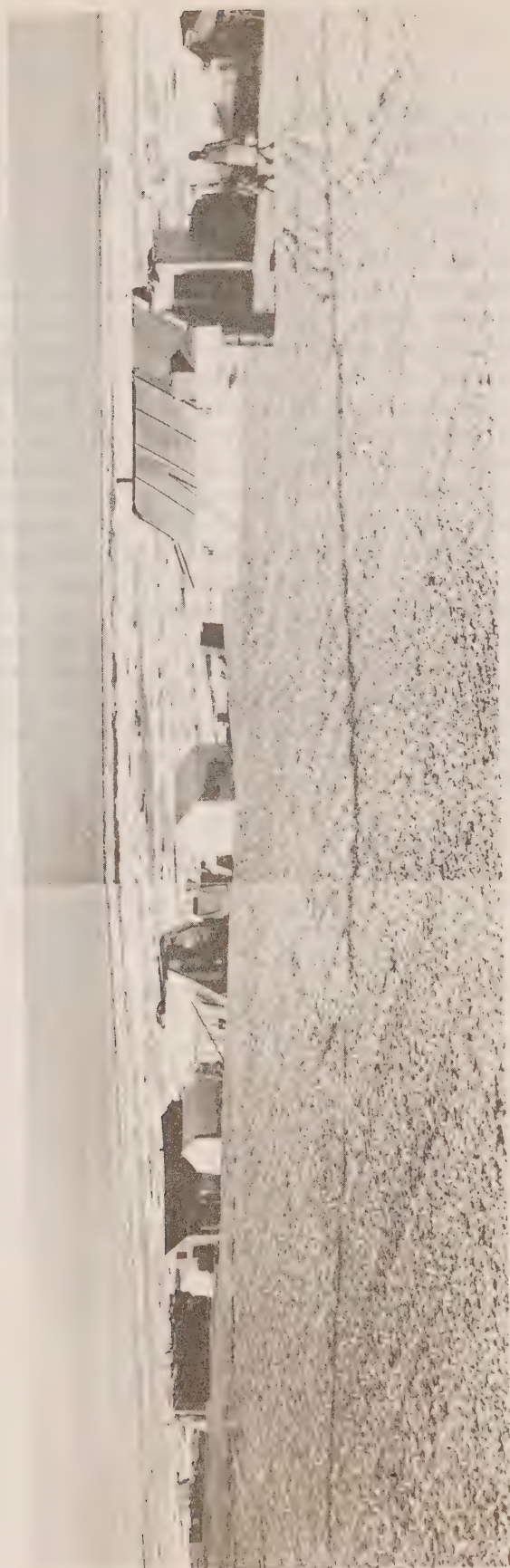
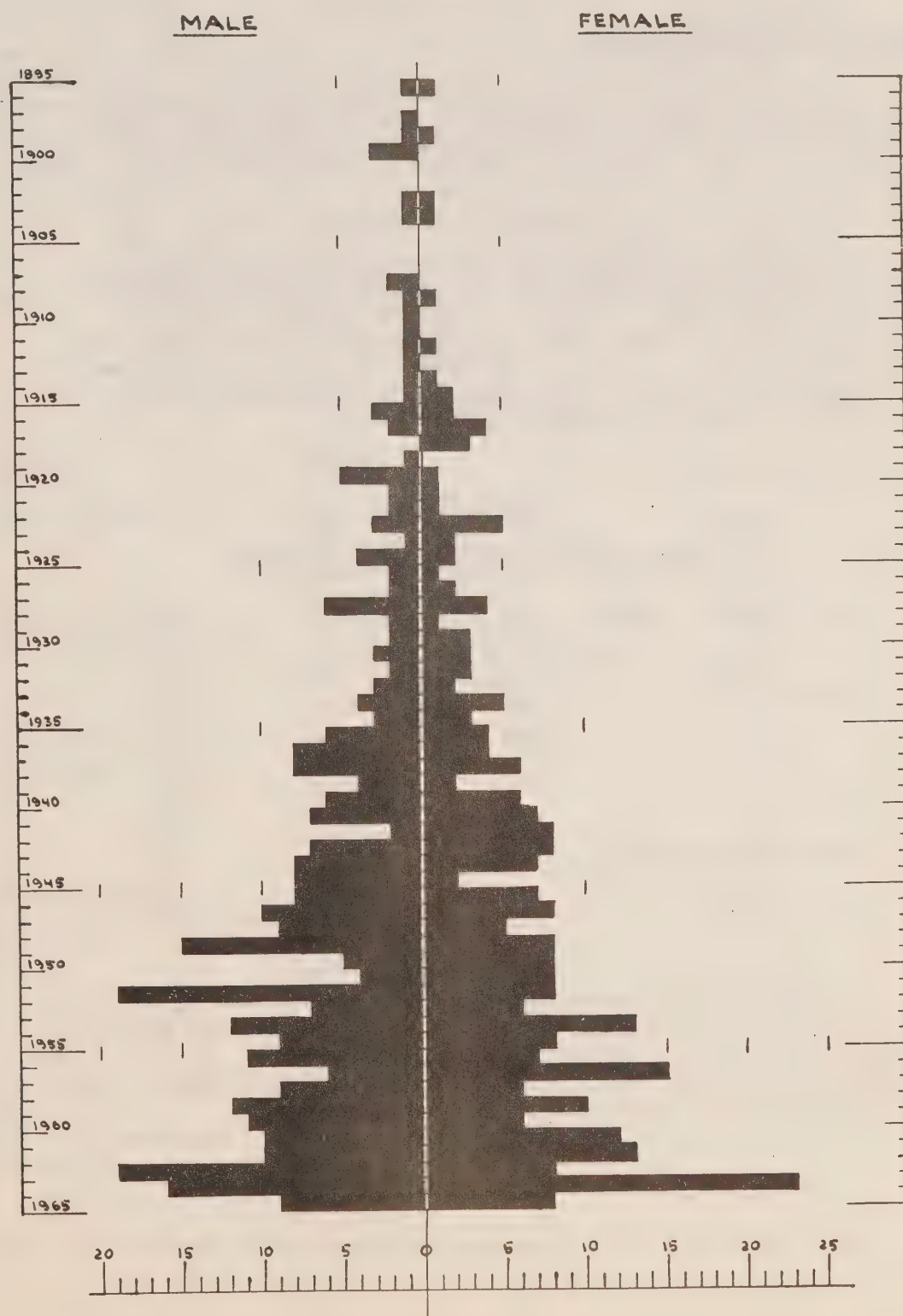


Figure No. 28: Eskimo native housing - Hall Beach, 1965

GRAPH N° 4POPULATION PYRAMID - JGLOOLIK REGIONSUMMER 1965.



## Chapter VI

### COMMUNICATIONS AND TRANSPORT

#### Mail and Telecommunications

Mail service into the region is now quite regular via the weekly Nordair flight from Montreal direct to Hall Beach. From Hall Beach mail is forwarded to Igloolik by Bombardier or by canoe.

The telephone system linking the DEW line sites with each other and with the outside world has been made available by Federal Electric Corporation for the general public for outside calls from Hall Beach. The Bell Telephone Company, which installed a local telephone system at Igloolik provides twice daily radio-telephone service out of Igloolik. Telegrams are handled by the Hudson's Bay Company. At present, the frequencies given in Table V are in use at Igloolik:

Table V

#### Communication Frequencies - Igloolik

Bell Telephone Company	3298	
	5128	
	7623	
R.C.M.P.	4785	
	7780	
	5680	(Air to ground)
	4837	(Emergency)
D.N.A. & N.R.	4270	
	4356	
Hudson's Bay Company	4837	
	4770	
R.C. Mission	3420	

At Hall Beach, a governmental radio-telephone set is installed at the I.N.H.S. nursing station. Between this and the area administrator's office at Igloolik a regular schedule is maintained. For the future it is possible that Hall Beach will become an important link in the Bell Telephone Company's tropospheric scatter system.

## Transport

### Sea

The first attempt at establishing a regular shipping service was made in 1939 with the establishment at Igloolik of a Hudson's Bay Company post. Ice conditions prevented the Hudson's Bay Company boat from reaching Igloolik from 1940 to 1943 in which year the post was abandoned. It was re-established in 1947. Since that time, the supply ship failed to reach Igloolik only in 1957. Since the establishment of the DEW line installation at Hall Beach in 1955/56 freighters and tankers have landed there regularly. During the past year, considerable amounts of construction material and equipment as well as fuel oil have regularly been shipped directly to Igloolik.

The cargo moved by vessels of the Department of Transport, Marine Operations Branch, in the area in 1964 is given in Table VI.

Table VI

#### Cargo Movements, 1964

<u>Vessel</u>	<u>Voyage</u>	<u>Cargo in lbs.</u>
CCGS "Gannet"	Montreal-Hall Lake	117,228
	Montreal-Rowley Island	11,690
	Montreal-Longstaff	12,938
	Kivitoo-Longstaff	40,500
CCGS "Montcalm"	Churchill-Hall Beach	13,011
CCGS "Wolfe"	Charlottetown-Hall Beach	40,000
	Hall Beach-Longstaff	206,500
	Longstaff-Hall Beach	128,000
CCGS "Skua"	Churchill-Hall Beach	1,309
	Churchill-Igloolik	1,020,020
	Churchill-Pelly Bay (via Hall Beach)	4,891
	Hall Beach-Longstaff Bluff	1,183,368
	Hall Beach-Rowley Island	1,177,384
CCGS "Eider"	Churchill-Igloolik	992,480
S.S. "Federal Pioneer" (Charter)	Hall Beach-Quebec	50,000
	Hall Beach-Montreal	528,600
	Montreal-Hall Beach	422,892
	Montreal-Igloolik	391,767
	Montreal-Longstaff Bluff	30,808
M.V. "Jos. Simard" (charter)	Goose Bay-Hall Beach	10,358,000
M.V. "Willowbranch" (charter)	Goose Bay-Hall Beach	2,842,000
	Montreal-Hall Beach	<u>3,366,000</u>

Total cargo moved in the area on Government acct. 22,939,386 lbs.



No detailed figures were available for Hudson's Bay Company shipping in the area, but the above data gives some idea of the volume and direction of sea-borne cargo traffic in the area.

Cargo rates are at present:

Montreal - Igloolik

\$87.50/ton

Churchill - Igloolik

\$35.00/ton

### Air

There is at present a regular scheduled Nordair flight once a week from Montreal to Hall Beach via Frobisher Bay, usually by DC-4 or Super Constellation. Federal Electric Corporation provides for DEW line personnel a direct weekly flight to Winnipeg. A representative schedule of air-freight prices is given below in the chapter on Baffinland Iron Mines Ltd. At the time of writing, negotiations were underway by TransAir Limited to purchase a Hercules Transport which could carry a payload of 25 tons at a speed of 325 m.p.h. and would require only a 3,000' air strip. Rates as low as 10 cents a pound from Churchill to Hall Beach would be feasible.

The air strip at Hall Beach is suited for any transport planes at present being operated commercially in Canada. In the summer, float-equipped planes can land on a small lake nearby. At Igloolik, in summer there is a gravel strip along the top of the ridge to the south-west of the settlement which is suitable if wind conditions are right for single-engined aircraft, except during break-up and freeze-up. During the winter months when the ice is strong enough, a strip is cleared and marked on the ice which can take DC-3's.

A variety of small planes are available in the area from a number of commercial operators who have planes stationed at Frobisher Bay, Churchill, Resolute and at times at Hall Beach. Rates vary considerably depending on the type of plane and the size of charter and on whether a plane is stationed at Hall Beach or whether it has to be flown in. Charters are available from TransAir, Nordair, Lamb's Airways, Wheeler's Airlines and Arctic Wings.

### Local Traffic

#### Dog Team

In the outlying camps the dogteam is still the only means of transport during most of the year if the one skidoo at Kapuevik is disregarded. Even at Hall Beach and Igloolik the dog team is not only indispensable to many Eskimos - that is, all those not in steady wage employment - but often resorted to by many whites. Although the number of teams fluctuates, the number counted in the course of the survey may be taken as characteristic. There were 21 teams at Igloolik, five at Hall Beach and 47 at the camps, for a total of 73 teams in the area. On the average, the number of dogs per team is eight but the number may fluctuate between six and ten or even twelve. Most Eskimos are in the habit of borrowing dogs for longer trips, for which teams of 12 dogs are usual. This would give a maximal dog population of 600 for the whole area, or almost as many dogs as there are Eskimos. On a dog team trip it was observed that two teams required

one seal per day for food, with an occasional day without food. This would mean two to three pounds of meat per dog per day for continuous hard work in winter. Dogs are fed considerably less in summer or even when not working in winter and as most of the Eskimos in the area do no longer subsist on the meat of sea mammals to quite the extent they used to, it is fair to assume that for the area as a whole the amount of sea mammal meat required by dogs is about the same as that consumed by Eskimos. In other words, half the hunting pressure exerted upon the sea mammal population of the area is due to the food requirements of the dog-population.

The komatiks, of which there are about as many as there are teams, are today made of sawed timber and equipped with steel runners. Though store-bought  $\frac{1}{2}$  inch rope is used by some Eskimos, thongs of walrus or square-flipper hide are preferred by most for bindings, due to their better wear-resistance and longer life when frequently wet. Some of the timber and steel used in komatiks is sometimes recovered from white men's waste but most of it is bought. A good komatik today represents a capital investment of about \$300. The biggest and best ones are owned by men at Igloolik with a relatively high money income. A good dog team with a load up to 1,000 pounds can travel 15 to 40 miles per day depending upon weather and ice conditions. Rental rate is about \$12.00 per day, which includes hire of the driver, if food for the driver is provided.

### Skidoo

At present, seven skidoos at Igloolik and one at Kapuevik are owned by Eskimos. They represent a capital investment of \$900 to \$1,100 each. Although this vehicle has considerable potential, this is far from being realized. Due to the fact that its purchase is motivated in most cases by status much more than by economic considerations, it must be considered as an outrageously expensive toy rather than as an alternative or supplementary means of transportation to the dog team for hunting or trapping. Skidoos have on occasion been rented to whites for short local runs but no definite rate has been established. About \$5.00 for half a day's use has been charged with the user supplying the gas. The main factors which at present keep the skidoo from being a positive asset to most of its Eskimo owners are inadequate maintenance, use over unsuitable ground - i.e. shingle beaches or slushy ice - excessive use for unnecessary joy-rides up and down the settlement "main street" and lastly unfamiliarity with the engine which often leads to the vehicle being distrusted for longer trips for which it would otherwise be eminently suitable. It seems that a compact course, which could be given locally to all users and prospective buyers, could do a lot to overcome these drawbacks and so do a lot to help the people to get full value out of their equipment and contribute towards substantially decreasing the dog population.



### Bombardier

Three Bombardiers are used at Igloolik and Hall Beach, two by the Department of Northern Affairs and National Resources and one by I.N.H.S.. The I.N.H.S. vehicle is used for local traffic between the nursing station and the airfield at Hall Beach. Those of the Department of Northern Affairs are used mainly for mail, passenger and freight service between Hall Beach and Igloolik as long as ice conditions allow. The Hall Beach - Igloolik trip takes about four hours by Bombardier as compared with 13 to 15 hours by dog team. Though in the western Arctic the higher productivity of Bombardier - equipped hunters and trappers over those using dog teams seems well proven, no individual Eskimo in the Igloolik region as yet has been able to afford one. It would seem highly desirable that one be purchased by the co-operative with the express purpose of being used for more extensive organized hunting trips. A specific proposal is included below in the recommendations.

### Canoes

As the dog team is in winter, so the canoe is in the summer the most widely used means of transport for travel between camps and settlements as well as for seal and walrus hunting. Most canoes in the area are 20' to 22' long and are powered by 5 to 25 horsepower outboard motors. The 9½ horsepower engine is the most popular size, closely followed by 18 horsepower. There are now ten canoes and sixteen motors owned by individual Eskimos at Igloolik, six canoes and seven motors at Hall Beach and 22 canoes and 21 motors in the camps. Additional boats and motors are owned by the Eskimo Co-operative, the Hudson's Bay Company and various government agencies. Boats are available for rent or charter, current rates being:

\$10.00 per day per boat

\$5.00 per day per motor (9½ H.P., more for heavier motors)

\$10.00 - \$12.00 per day per guide (food for guide to be supplied)

The value of canoes and motors depends, of course, on size and make but prices are well in line with those in the south, allowing for transportation charges.

Although the introduction of the canoe and its easy availability has greatly increased the mobility of the Eskimo population and on the whole contributed to its increased material well-being, there are two areas of what might be termed misapplication. One of these results in the waste of money and the other in the waste of resources. The first instance is the use of the canoe in seal-hunting. It can be used to advantage in hunting square-flippers as these can usually be approached closely by boat when lying on the ice near its edge and present a relatively good target and may be killed with one shot but they are not overly plentiful and often a whole day will be spent cruising about without seeing one. On almost every boat trip, even a short one across Turton Bay, some ringed seal are seen, whose diving periods are much shorter than those of square flippers or harp seals. Practically every

sighting results in a 10 to 30 minute hunt in the course of which a great many shots are fired with the seal rarely being hit and secured. An estimate of 20 to 30 shots per ringed seal secured in hunting by canoe is probably conservative. Allowing for gas consumption that means that this manner of seal hunting is quite uneconomical and that by engaging in it frequently some Eskimos waste a fair portion of their meagre cash during the open water season. In walrus hunting by canoe the situation is somewhat different. Eskimos will hardly tackle a swimming herd in open water but usually try to approach a group hauled out on an ice floe. An animal killed instantly on a floe is easily secured and slaughtered while one killed in the water after being secured by harpoon usually has to be slaughtered over the side of the canoe. In either case most of the carcass is abandoned. The abandoned portion is about one half of the weight of the animal and most of this would make good dog food. It happens occasionally that the carcass slips the hook before all the meat it is intended to recover is secured. On the whole it might be estimated that the exclusive use of larger boats which could land the whole carcass might increase the yield of walrus hunting by 30 per cent to 50 per cent.

#### Whale Boats, Trap-Boats and Peterheads.

The introduction of larger boats earlier in the century might be considered as having heralded the beginning of the end of traditional Eskimo subsistence economy, as it vastly increased the Eskimos' ability to bring in, during a relatively short season, walrus and white whales. At present, individual Eskimos in the area own eight large boats with motors and four without motors. One of the eight is owned by a DEW line employee at Hall Beach and should strictly be called a pleasure craft. Although the Eskimos will charter the boats to visitors they prefer not to. Chartering them during the relatively short hunting season would considerably decrease their walrus and white whale take. Ownership of the larger craft is well distributed through the region, but an additional boat each at the South Camp, Iglugjuak and Agu Bay would considerably improve the situation at those camps. On Igloodik Island the construction of primitive slips at the south-east corner of the island could increase the utilization of the boats at Igloodik considerably.



Chapter VIIRESOURCES AND ACTIVITIESThe Igloolik Co-operative\*

The Igloolik Co-operative was incorporated in 1963. It received at that time a loan of \$3,000 from the Eskimo Loan Fund for the purchase of carvings from individual members for resale.

The number of shareholding members - in most cases the heads of households - in 1965 was 42 out of a total of 134 families in the Igloolik area. Shares subscribed exceeded \$5,000. Total cash assets - bank balance, accounts receivable, stock on hand, less accounts outstanding - were a little over \$7,000. Carving and some sewing at present provide the bulk of the co-operative revenue, though some game meat, fish and vegetables are retailed. There is hope of expanding these activities. The co-operative also mail orders various items of clothing and equipment for retailing.

The capital equipment and property at present owned by the co-operative is given in Table VII

Table VIICapital Equipment - Igloolik Co-operative

1	Peterhead	"Nauyak"	Acquired under Small Boats Asst. Program
1	Longliner	"Tugliejuak"	"
1	Tender	"Kaglulik"	No accepted value established
1	canoe		"
1	skiff		"
2	D8 Tractors @ \$10,000		"
1	trailer for above		"
1	"Husky" snow tractor		"
1	meat house		"
1	garage		"

Warehouse, garage and house modules  
to be dismantled from Bray Island DEW  
line site and brought to Igloolik

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\* The information is based on an interview between Father Fournier, secretary of the Co-operative, and Mr. K. Crowe, on June 21, 1965.

Much of the equipment was acquired as salvage from Crown Assets Disposal Corporation. In the case of the boats, the greater part of the purchase price is as yet unpaid. No proper accounting system exists as yet, though assistance was requested for setting one up. Until this is done, it is not possible to make an accurate statement on the financial situation of the co-operative, or to give accepted values of capital assets.

At present many of the carvings are sold at Hall Beach direct to DEW line personnel. Others are sold locally or shipped to Ottawa. Expansion of a small subsidiary store at Hall Beach has been suggested but no decision reached. There seemed to be general and considerable interest in expanding the operations of the co-operative, particularly in the directions of fur marketing and food dry-goods retailing. Some members seemed to be interested in participating in training courses on fur-marketing and grading, auction procedures, etc. With regard to retailing, local business volume is certainly large enough to support two stores according to the figures for average trade volumes in American retailing cited in Weiss. However, no attempt at significant increases in co-operative business activities should be undertaken unless guided by a qualified Co-operative Development Officer.

#### The Hudson's Bay Company Post

The Hudson's Bay Company first established a post at Igloolik - the site that was then known as Ikpiakjuk - in 1939, two years after the mission of the Oblate Fathers had been moved there from Abadjag. Up to that time the local Eskimos had been trading at Pond Inlet or Repulse Bay. When the company supply ship failed to reach the post between 1940 and 1943, the post was abandoned in 1942 but was re-established in 1947. Since that time, the supply ship reached the post every year except in 1957, when an airlift was necessary. It is of interest to note that the re-establishment of the post preceded by only one year the institution of the family allotment system. This puts more than \$2,000 monthly into the economy, a factor which would certainly tend to exert a stabilizing influence upon local trade.

The Hudson's Bay Company now occupies approximately 400' x 450 feet of ground along the beach. It is located between the eastern part of the settlement which centers upon the R.C. Mission and the western part around the administrative complex. This ground is bare of vegetation and the gravel of the raised beach provides an excellent base for construction. On that ground the company now has eight buildings, including a large new supermarket-type store, the manager's residence, Eskimo clerks' dwelling, several warehouses, an emergency power house and a small boat house. Three wells dug near the manager's residence provide enough water between break-up and freeze-up for his own use and that of some Eskimos living close by.



The staff consists of a white manager and a white assistant. Both are single and live at the manager's residence. One Eskimo clerk employed at a salary of \$150 per month lives with a wife and two children in the old managers' residence. An Eskimo handyman who earns about \$100 per month lives with a wife, three daughters and three adopted sons in another Hudson's Bay Company building converted into a residence. An Eskimo widow with three dependent children is employed as a housekeeper for the manager and his assistant at \$90 per month.

The new store is modern and carries a good assortment of foods, household goods and appliances, clothing and yardgoods and camp and trail equipment. An indication of the high living standard of many local Eskimos is the assortment of cameras, musical instruments, expensive sporting rifles, and what might be called non-functional clothing - this latter primarily for the teen-agers - carried in stock at the store. Most items not in stock may be ordered through the store. Total volume of trade is currently more than \$100,000 per year.

Representative retail prices in the summer of 1965 are given in Table VIII.

Table VIII

Retail Prices - Igloolik H.B.C. Store - Summer '65

Fuel Oil/gal.	\$ .37	White Flour/100 lb. bag	\$12.90
Kerosene/gal.	1.20	White sugar/5 lbs.	1.10
Acto gas/gal	1.16	Tea/lb.	1.50
Leaded gas/gal	1.16	Coffee/lb.	.98
.30 - .30/20 rds.	4.49	Carnation milk/large tin	.28
.22 long/500 rds.	9.50	Powdered milk/lb.	.85
Duffel/yd	9.50	Canned butter/lb.	.91
Cigarettes/pkg. of 20	.40	Lard/lb.	.30
Players Fine Cut/8 oz. tin	2.00	Tomatoes/20 oz. can	.44
chocolate bars/2	.25	Strawberry Jam/24 oz. can	.95

The Hudson's Bay Company is practically the sole buyer of fur and sealskins. The proportion bought by others is negligible. The Hudson's Bay Company buys some small carvings, handles the local telegram traffic over its own frequency as a public courtesy and the company's staff runs the local movie showings two to three times weekly. The profits from the movies go towards the purchase of projection equipment for the community. Visitors can purchase at the store various souvenir items, Eskimo dolls and furs and sealskins.

## Furs and Carving

Fur is by far the biggest single source of income for the Eskimos of the region. In 1964 it amounted to 78.1% of earned cash income or about 56% of total cash income of the Eskimo community, i.e. including all welfare, pension and family allowance payments. The figure of 78.1% breaks down as follows: White Fox - 17.8%; Ringed seal (adult) - 32.8%; Square Flipper - 1.7%; and Silver Jar - 21.9%. From Graph No. VII, showing seasonal income relationships, the very sharp seasonal fluctuations of fur income become apparent. Income from fur shows a major peak in December and a minor peak in April. Income from Ringed Seal fur showed a major peak, co-incident with maximum total income, in July and a secondary one in September, both of which are due to sales of Silver Jars. The peak for adult Ringed Seal in October is obscured by the end of the Silver Jar season. All fur prices fell recently and no reversal was, in the summer of '65 expected for the foreseeable future. In spite - or perhaps because of - the drop in Ringed Seal prices, considerable wastage of skins of adult seals killed for human or for dog food was noted during field trips in early summer (many skins, usually with blubber attached are left behind). In May and June, when total income is low and relief requirements rise, the advisability of bringing home and clearing every available skin should be most emphatically stressed. In addition, the organization of a large hunt from Igloolik to the western end of Fury and Hecla Strait, for which a Bombardier might be made available on a rental basis, might do a lot to eliminate this critical period. In late May or early June when weather conditions in this area are usually quite good, an additional 200 plus skins should almost eliminate the welfare increment required in this period. Such an increase in seal take in the western Fury and Hecla Strait area should be quite within the sustainable yield limit of its Ringed Seal population. The efficiency of traps and hooks in this context should be tested. Similarly, the drop in adult seal takes in August and September might be markedly attenuated by wider use of nets. Any such attenuation would, to some extent, be reflected by a lower rate of increase in the welfare payments during October and possibly November.

Carving in soapstone and in ivory so far plays only a minor role in the local economy (3.4% of 1964 earned income). Some local carvers, however, turn out excellent work. Figures No. 29 and No. 30 show two views of an outstanding soapstone carving by Mr. P. Kolaut, who several years ago carved the ivory chess set which was presented to the Queen. At present, most carvings are sold through the Co-operative to DEW line employees and visitors at Hall Beach or to visitors at Igloolik. Prices are usually set by a committee of Co-operative members. There is little doubt that in this way, higher returns can be realized than by selling via Ottawa; also, individual carvers would know immediately how soon their work was bought and how much the buyer was prepared to pay for his work. Even if an item is occasionally underpriced, the close connection between producer and market has an educational value far



TABLE NO. IX

## SUMMARY OF CASH INCOMES AT JGLOOLIK, EXCLUDING WELFARE PAYMENTS.

PERIOD	WAGES \$	CARVING \$	WHITE FOX NO. UNIT PRICE, TOTAL \$	RINGED SEAL NO. UNIT PRICE, TOTAL \$	SQUARE FLIPPER NO. UNIT PRICE, TOTAL \$	OTHER FURS NO. UNIT PRICE, TOTAL \$	COMMUNITY DEVELOPMENT WAGES \$	TOTAL \$
JAN. '64	1,570.91	596.95	143 13.68 1,956.00	30 14.73 442.00	1 12.00 12.00	SILVER STAR 8 14.63 117.00		4,964.56
FEB. '64	1,570.91	841.50	59 13.92 822.00	148 14.29 2,115.00	— — —	— — —		5,349.41
MAR. '64	1,570.91	509.00	121 12.00 1,451.50	102 14.42 1,471.00	1 10.00 10.00	— — —		5,012.41
APR. '64	1,570.91	486.75	154 12.16 1,872.50	125 12.90 1,612.00	5 18.60 93.00	— — —		5,635.16
MAY '64	1,570.91	—	53 8.78 465.50	271 11.49 3,113.00	7 16.71 117.00	— — —		5,266.41
JUNE '64	1,570.91	69.00	13 8.46 110.00	356 9.22 3,282.00	8 15.13 121.00	SILVER STAR 45 21.11 950.00		6,102.91
JULY '64	1,570.91	—	— — —	384 9.82 3,770.00	10 18.70 187.00	SILVER STAR 388 21.21 8,235.00	358.50	14,121.41
AUG. '64	1,570.91	—	— — —	367 9.15 3,358.00	18 21.50 387.00	SILVER STAR 259 18.29 4,737.00	133.00	10,185.91
SEPT. '64	1,570.91	—	— — —	276 9.23 2,548.00	14 19.71 276.00	SILVER STAR 319 16.52 5,261.00	582.25	11,238.16
OCT. '64	1,570.91	—	— — —	504 11.23 5,660.00	14 22.57 316.00	— — —	363.00	7,909.91
NOV. '64	1,570.91	—	139 7.72 1,073.00	231 9.29 2,145.50	2 17.00 34.00	— — —	372.00	5,195.41
DEC. '64	1,570.91	713.75	973 9.03 8,785.00	99 9.47 938.00	1 16.00 16.00	POLAR BEAR 2 60.00 120.00	152.50	12,296.16
JAN.-DEC. '64	18,850.92	3,216.65	1655 10.00 16,535.50	2893 10.53 30,454.50	81 19.37 1,569.00	SILVER STAR 1079 18.81 20,300.00 POLAR BEAR 2 60.00 120.00	1,961.25	93,007.82
JAN. '65	2,311.94	546.00	421 9.11 3,836.50	43 8.73 375.50	— — —	— — —	270.50	7,340.44
FEB. '65	1,991.97	857.00	282 8.31 2,343.00	72 8.11 584.00	1 16.00 16.00	— — —	24.00	5,815.97
MAR. '65	2,456.00	629.00	170 8.79 1,494.50	87 9.43 820.00	2 20.00 40.00	— — —	388.17	5,827.67
APR. '65	2,147.47	847.00	170 8.48 1,442.00	133 10.01 1,331.00	1 32.00 32.00	WIGAGUL 1 .50 .50		5,799.97



Figure Nos. 29 & 30: An outstanding example of Igloolik carving by Pacome Kolaut.



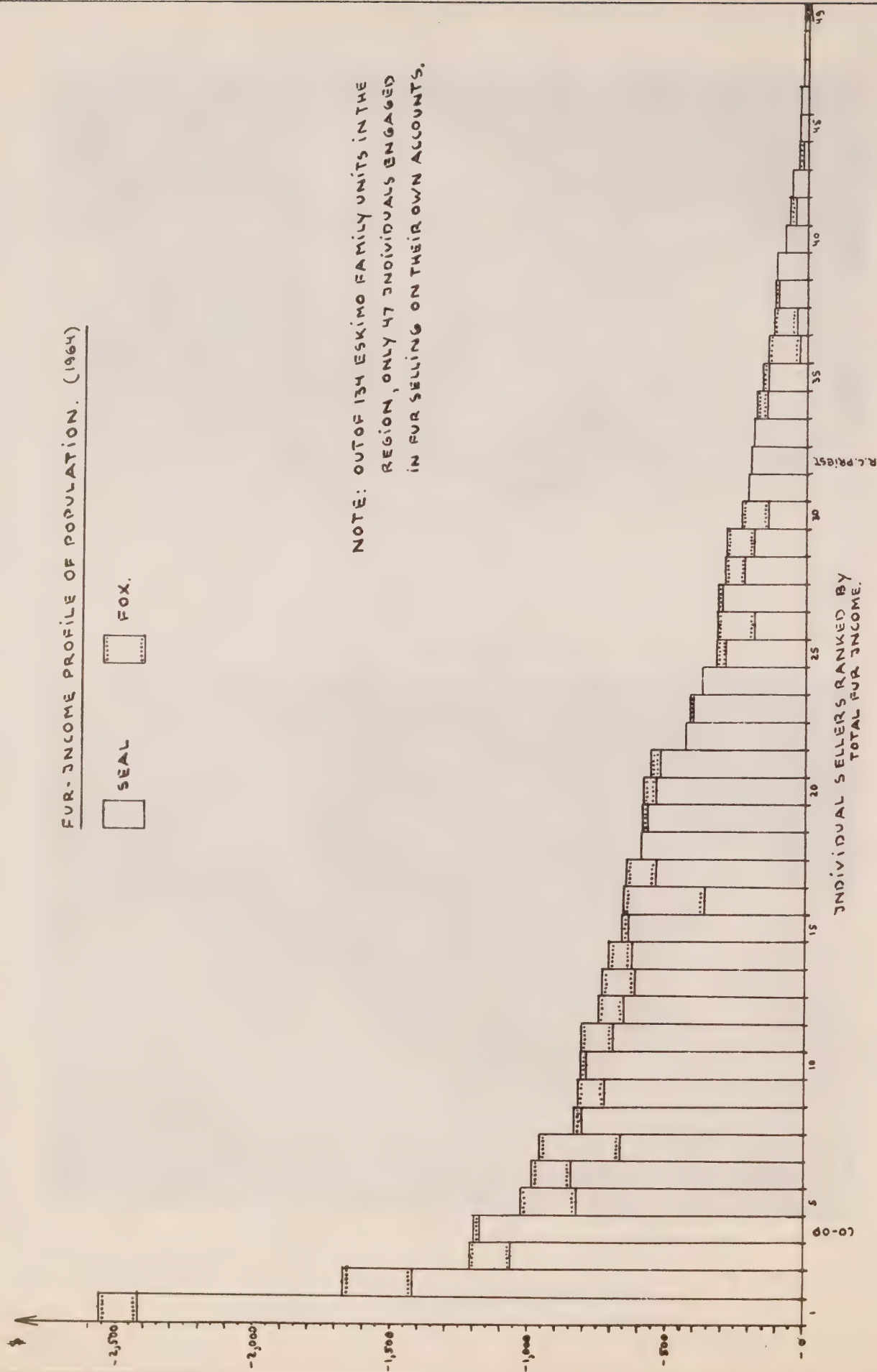
Photos courtesy Mr. W. Buske,  
owner of the carving.



FUR-INCOME PROFILE OF POPULATION. (1964)

SEAL FOX.

NOTE: OUT OF 134 ESKIMO FAMILY UNITS IN THE REGION, ONLY 47 INDIVIDUALS ENGAGED IN FUR SELLING ON THEIR OWN ACCOUNTS.



outweighing any potential temporary disadvantages. There is no doubt that some carvings are strictly "souvenirs". Only a few men are real artists and outstanding work brings outstanding prices but all men engaged in carving are learning to judge their work realistically and the artistic as well as the souvenir carvers are fast acquiring a fairly sophisticated business sense. Some attempts have been made at sealskin souvenirs - particularly hand bags and dolls - but so far with little success. This failure is largely attributable to the absence of competent instruction in sewing and styling. A few small amautiks of linen, with traditional decorations (women's garment, blouse-like with elongated front and tail and large hood to carry a baby) for five to twelve year old girls, become popular with southern girls, who like to carry their dolls in the hood. It would seem justified to post a craft instructor at Igloolik for a year and to attempt by increasing handicraft activity during the winter months to eliminate most of the need for welfare for economic causes and at least to lower welfare for reasons of health or dependent children. An attempt could also be made to try to produce more sealskin clothing for local use, possibly to install a small tannery for this purpose, to be operated by the Co-operative. There seems to be little doubt that by boosting local use of locally made outer sealskin garments, a subsequent substantial reduction of expenditures for similar store-bought clothing, would plow back some money into the hands of presently under-utilized members of the community and would make the amounts saved available to the buyers for alternative use.

### Local Wage Employment

Regular employment is at present available to the Eskimos at Igloolik, Hall Beach and at DEW line sites. At Igloolik, the regular employment by the Hudson's Bay Company has been covered in the preceding section. The Department of Northern Affairs and National Resources employs on a regular basis an Eskimo interpreter - a young man who still lives with his family of six and who are largely dependent upon him. The Department also employs a school janitor supporting a wife and four children, a couple acting as hostel parents that have two children of their own, and three men as mechanical helpers and labourers, all married and with one, two and three dependent children. The R.C.M.P. constable at Igloolik will have a regular Eskimo special constable assigned to him shortly. White government staff consists of an Area Administrator, a clerk, and an equipment mechanic, a school principal and two teachers, a nurse and the R.C.M.P. constable. The Roman Catholic priest is white and the Anglican minister is an Eskimo. Some Eskimo girls and women are frequently employed by local whites to do house work and some men are employed each year for a few days or weeks as guides. One man from Igloolik was, during the summer of 1965, at Mary River as a labourer.

In late summer when the ships arrive, a number of men are hired on an hourly basis to help unload. Local labour is also hired for housing and other construction.



TABLE NO. **X**SUMMARY OF WELFARE PAYMENTS - JGLOOLIK REGION - FISCAL YEAR 1964-1965  
(FAMILY ALLOWANCES EXCLUDED)

PURPOSE CAUSE		GROCERIES	CLOTHING	FUEL	SHELTER	OTHER	TOT. AMOUNT	RECIPIENT FAMILIES	# PER FAMILY	% OF TOTAL COMMUNITY INCOME (EXCL. FAMILY ALL.)
HEALTH	1964 APRIL	383	198	385	—	59	1025	9	114	
	MAY	377	20	253	—	88	738	7	105	
	JUNE	1225	88	770	—	128	2211	16	138	
	JULY	653	16	193	74	90	1028	10	103	
	AUGUST	740	—	248	—	124	1112	13	86	
	SEPTEMBER	100	50	238	—	145	533	12	44	
	OCTOBER	655	20	130	—	185	990	9	110	
	NOVEMBER	990	112	168	—	125	1395	12	116	
	DECEMBER	1083	112	229	—	175	1601	15	107	
	1965 JANUARY	1105	29	347	—	192	1673	20	84	
	FEBRUARY	1270	74	384	—	195	1923	20	97	
	MARCH	1185	55	350	—	192	1782	20	89	
	TOTAL	9770	774	3695	74	1698	16011	AV. 13.6	1180 P.A.	13.4 %
DEPEN- DENT CHILDREN	1964 APRIL	237	41	231	—	17	526	4	132	
	MAY	301	—	220	—	23	544	5	109	
	JUNE	42	37	49	—	—	128	2	64	
	JULY	120	—	25	—	10	155	1	155	
	AUGUST	235	—	99	—	35	294	3	98	
	SEPTEMBER	190	25	44	—	35	294	3	98	
	OCTOBER	100	—	18	—	—	118	1	118	
	NOVEMBER	100	—	36	—	10	146	2	73	
	DECEMBER	100	—	23	—	10	133	1	133	
	1965 JANUARY	80	—	35	—	15	130	1	130	
	FEBRUARY	—	—	—	—	—	—	—	—	
	MARCH	200	30	35	—	25	290	4	73	
	TOTAL	1705	133	815	—	180	2833	AV. 2.4	1180 P.A.	2.4 %
ECONOMIC CAUSES	1964 APRIL	123	32	61	—	—	216	4	56	
	MAY	36	—	22	—	—	58	1	58	
	JUNE	205	35	24	22	279	565	14	40	
	JULY	15	10	—	—	20	45	5	9	
	AUGUST	152	16	110	11	66	355	5	71	
	SEPTEMBER	75	—	23	—	10	108	1	108	
	OCTOBER	255	50	62	—	165	532	6	89	
	NOVEMBER	—	—	—	—	—	—	—	—	
	DECEMBER	5	—	4	—	10	19	2	10	
	1965 JANUARY	419	35	62	—	182	698	14	50	
	FEBRUARY	469	16	65	—	336	886	23	38	
	MARCH	164	33	45	—	294	536	17	31	
	TOTAL	1918	227	478	33	1362	4018	AV. 8.4	480 P.A.	3.4 %
TOTAL	1964 APRIL	743	271	677	—	76	1767	17	104	
	MAY	714	20	495	—	111	1340	13	103	
	JUNE	1472	160	843	22	407	2904	32	91	
	JULY	790	26	218	74	120	1228	16	76	
	AUGUST	1127	16	457	11	225	1836	21	87	
	SEPTEMBER	365	75	305	—	190	935	16	58	
	OCTOBER	1010	70	210	—	350	1640	16	103	
	NOVEMBER	1090	112	204	—	135	1541	14	110	
	DECEMBER	1190	112	256	—	195	1753	18	98	
	1965 JANUARY	1604	64	444	—	389	2501	35	71	
	FEBRUARY	1739	90	449	—	531	2809	43	65	
	MARCH	1549	118	430	—	511	2608	41	64	
	TOTAL	13393	1134	4988	107	3240	22862	AV. 23.5	97 P.A.	19.1 %
GRAND TOTAL		13393	1134	4988	107	3240	22862	AV. 23.5	97 P.A.	19.1 %
% OF TOTAL COMM. INCOME (EXCL. FAMILIAL)		11.4 %	.95 %	4.2 %	.1 %	2.7 %	19.1 %			

(FAMILY ALLOWANCES WERE EXCLUDED AS BEING OUTSIDE NATIVE OR ADMINISTRATIVE INFLUENCE.)

At Hall Beach, the Department of Northern Affairs employs two Eskimos as assistants to the white equipment mechanic stationed there. Another Eskimo is employed at the nursing station which is staffed by two white nurses, with an Eskimo woman performing some nurses' aid duties, on a part-time basis. One Eskimo is employed steadily by Nordair as a janitor at \$100 per month. These four steadily employed Eskimos support a total of 16 dependents. One former Department of Northern Affairs and National Resources employee worked steadily at Mary River during the 1965 season. As at Igloolik, the sea-lift offers some additional opportunities for wage employment for a short time each summer.

Employment by Federal Electric Corporation on the still active DEW line sites in the survey area is 12 men, who support a total of 49 dependents. Four of these Eskimos are originally from the Western Arctic. FEC employment thus accounts for the livelihood of nearly 10 per cent of the Eskimo population directly and due to the close kinship ties still operative in Eskimo communities, probably boosts the living standard of a similar percentage indirectly. With the gradual closing down of the DEW line sites, these 10 jobs for Eskimos will disappear, but this need not disrupt the local economy to too great an extent. A few of the men involved should find no difficulty in obtaining employment in industry or construction a little further south. They not only possess considerable skills but also speak English fluently and could integrate without difficulty into northern Euro-Canadian society. The others could be employed at Hall Beach or Igloolik in similar capacities to those they now fill. With some encouragement, Nordair should be willing to substitute Eskimos for at least a few of their white labourers.

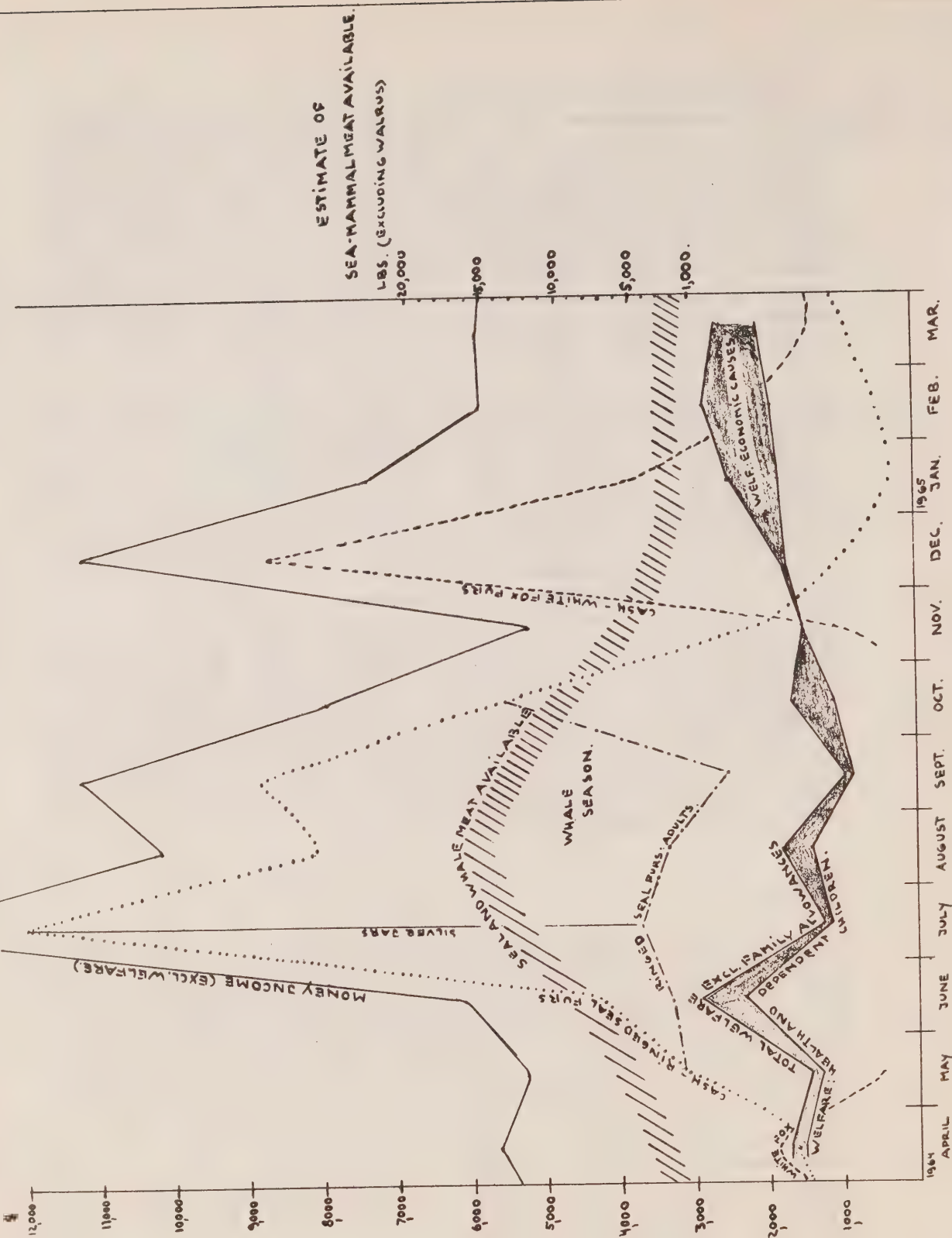
### Welfare

Table No. IX summarises the welfare payments for the Igloolik region for the fiscal year 1964-65. It is broken down by cause of need and requirement. Statutory payments for the region, which are between \$25,000 and \$30,000 per year were not included as, being relatively constant for most families and outside either native or administrative influence, they would not significantly influence short-term welfare requirements. To reflect statutory payments as well, percentages of community income excluding them as shown in the table would have to be reduced by about 1/6.7. The outstanding features in this list are that health constitutes the predominant cause of need and that food is the predominant requirement. Economic factors are cited by more families as a cause of need than dependent children. The total for economic needs is higher but the amount per family per year is not half as large. Relief requirements for shelter are negligible. Income, welfare and hunting data were plotted in Graph No. VII and in Graph No. VIII. An attempt was made to extract two apparent relationships from the former. The simplified curves in Graph VIII were only fitted visually, taking into account relevant comments by some local contacts and thus contain a strong hypothetical



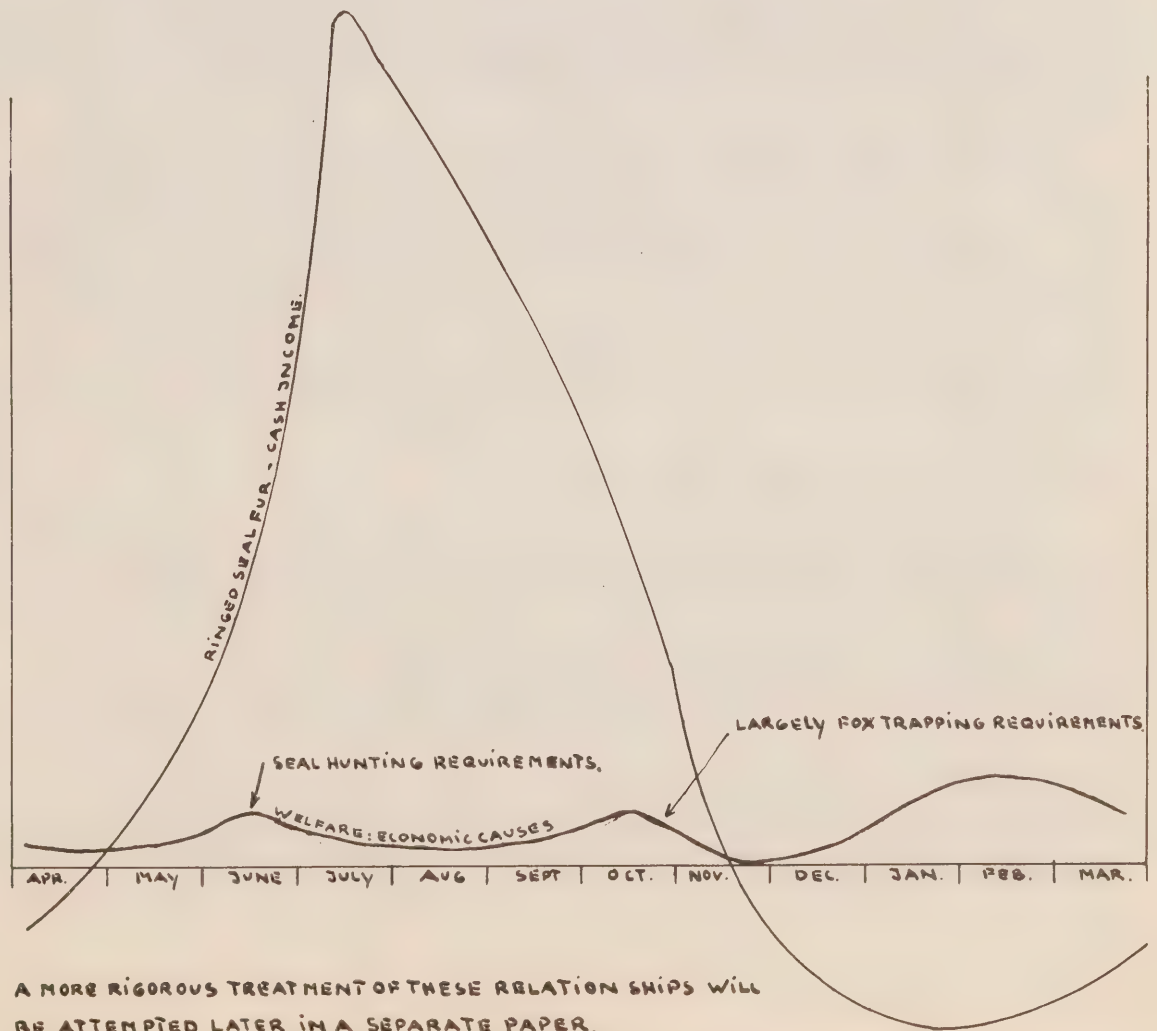
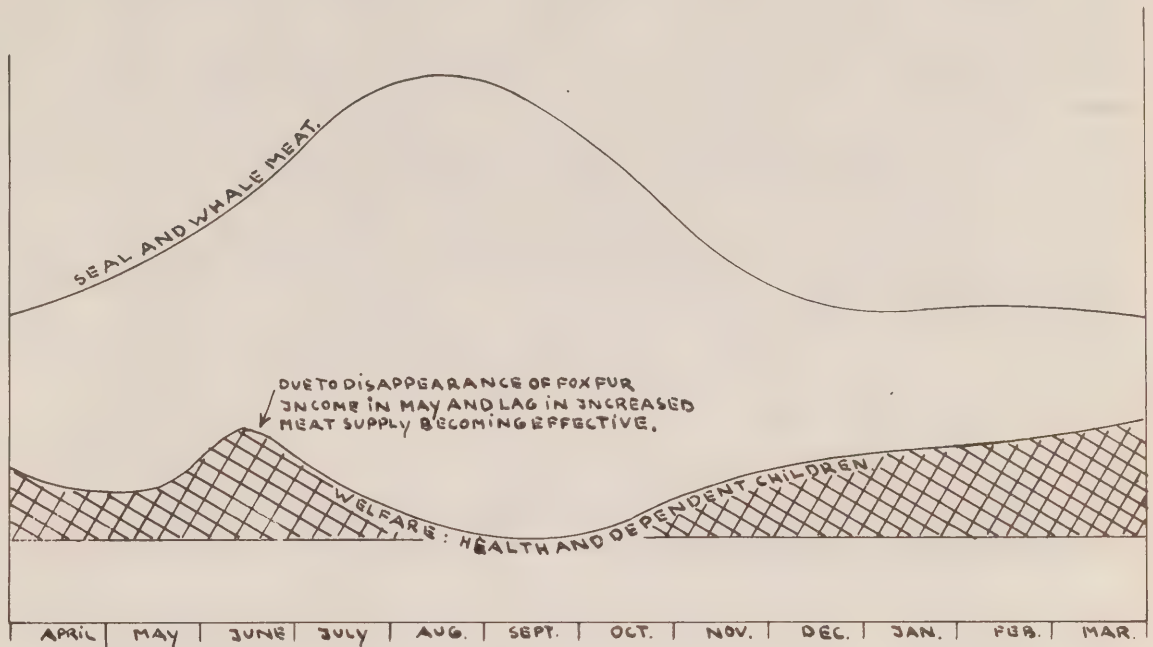
GRAPH NO.: VII

SEASONAL RELATIONS BETWEEN INCOME, WELFARE AND HUNTING.



## GRAPH. N° VIII.

APPARENT WELFARE RELATIONS, SIMPLIFIED FROM PRECEDING GRAPH.



A MORE RIGOROUS TREATMENT OF THESE RELATION SHIPS WILL  
BE ATTEMPTED LATER IN A SEPARATE PAPER.



element. It is intended, however, to compare these dates with those from other Arctic areas and to attempt a more rigorous mathematical treatment in a separate study. As given in Graph VIII, the upper graph seems to point to a reasonably consistent inverse relation between availability of seal and whale meat and welfare payments for reasons of health and dependent children. Considering the high percentage of welfare money going into food purchases, this upper graph, together with the data in Table IX, might be interpreted further as indicating the existence of a hard core of about 10 families requiring consistently about \$100 per month each. Welfare needs over and above this basic requirement - represented by the cross-hatched area in the upper graph - may then be attributed largely to lack of seal and whale meat. The implication is that such needs could be almost completely eliminated through provision of adequate freezer and storage facilities. But even beyond this, the low dollar per family figures for health reasons for August and September and the low total amount required for food during September i.e. when whale meat is available, indicate that even the basic requirements of the core of welfare recipients postulated above could be lowered to some extent by the same means.

The connection - or better, perhaps, the possibility of a connection - between revenue from sealskins and welfare payments for economic causes is less clear. The period of highest payments of this kind, during January and February, follows the sharp long term drop in sealskin revenues from its seasonal high in July and is unaffected by the high in fox fur revenues in December. The slight rise in welfare payments during August over the July and September level may be ascribed to accidents of timing of requests so that an averaging out of July, August and September payments seems justified and the slight peaks in June and October are largely attributable to grub-staking requirements for summer-hunting and fox trapping respectively. The provision of freezer and storage facilities suggested in the preceding paragraph would probably affect welfare requirements for economic reasons to a limited degree only. However, an attempt at improving spending habits, particularly among predominantly seal-hunting family heads, should result in a marked reduction in those requirements.

#### General Notes on Social Conditions

Health standards are still far from what we would call acceptable. There seemed to be general agreement, however, that there has been a steady improvement over the past few years. Particularly since the establishment of the nursing station at Hall Beach and the recent positioning of a public health nurse at Igloolik the rate of improvement has been increasing. Patients from the south camp and from Napakut are taken directly to Hall Beach. From the other camps the patients are first taken to Igloolik and then to Hall Beach if required. The station at Hall Beach is staffed by two nurses, but doctors from Fox Main will help out in any serious emergency. If necessary, patients at Hall Beach can be flown out to Frobisher Bay or

Montreal. The nursing station at Hall Beach maintains a daily radio schedule with Igloolik. The facilities available now have already contributed to an increase of trust and security by the people. They feel that in case of accident or sickness competent medical attention is within reach. In the spring of '65 for example, a boy at Agu Bay accidentally pulled the trigger of a loaded rifle while apparently leaning his head upon the barrel. A bullet penetrated his lower jaw and went through the roof of his mouth, inflicting a serious wound. The camp boss radioed Igloolik and Mr. R. Sheardown, who happened to be nearby with his plane, flew the boy to Hall Beach. From there he was quickly passed to a Montreal hospital for specialist treatment. He returned during the summer without permanent damage. Such an episode has a considerable effect upon the people.

In recent years, the following specific health problems were reported:

In July 1959 generally poor health conditions existed at Qimmiqtukvik which presented a general unclean appearance (these people were in '65 counted in the Napakut camp). There was suspicion that use of food from the DEW line dump was the cause of bad sores around the mouths of many children.

In 1961 four deaths occurred among the Hall Beach group. Autopsies at Montreal attributed the deaths to trichinosis, probably due to consumption of insufficiently cooked walrus meat. Twelve other members of the group were seriously ill but recovered.

In July 1962 a measles epidemic struck Hall Beach, affecting 90% of the population. There had been no record of measles for the preceding 10 years. Two adults and four babies died at Hall Beach. Two cases of encephalitis and four miscarriages following a subsequent tuberculosis infection were reported.

There have been no cases of starvation for some time. A serious food shortage was reported in February 1964 from a camp at Manikot. An immediate check showed that the situation had been badly exaggerated and that the camp suffered mostly from poor leadership which manifested itself, among other things, by a very unclean appearance of the camp.

There have been a few incidents due to drinking at Hall Beach but they were of an isolated nature. Alcohol is not expected to become a problem in the area in the near future.

The housing and adult education programs which started shortly after the completion of the survey will no doubt contribute greatly to improve health and sanitary conditions.

Sub-standard shacks were used for homes at Hall Beach by three families (14 persons), at Igloolik by one family of four and in camps by 30 families (135 persons). Tents and/or snowhouses, according to season, were used at Hall Beach by five families (28 persons) at Igloolik





Figures No. 31 & 32: Eskimo Shacks - Igloolik



by 13 families (59 persons) and in all camps by 21 families (93 persons).

As the movement from the camps into Hall Beach and Igloolik continues and as housing there improves it would seem desirable to expand school facilities at Igloolik to eliminate the necessity of sending the older children out to boarding schools at Chesterfield and Churchill. This local expansion of schools would also be desirable with a view to integrating adult education programs with those for the teenage group. It would also help to ease tensions within the families that can frequently be traced to the long absences of adolescents at boarding schools and the different atmosphere to which they are there exposed. While the boarding schools at Churchill and Chesterfield certainly fulfil a useful purpose while housing conditions in the Hall Beach - Igloolik area are largely substandard, the improvement in housing standards eliminates this justification for sending children out. The size of the adolescent group in the area as well as the indirect benefits from continuous attendance at the same school would seem to justify enlargement of the facilities at Igloolik.

Finally, the prevailing attitude among the local Eskimos - to which there are, of course, some exceptions - toward their material possessions should be mentioned. Though it has been explained by cultural anthropologist and sociologist in terms of Eskimo intellectual culture, that attitude can, by our standards, only be called appalling. Tools, guns, outboard motors were frequently seen left lying around unprotected and consequently often badly rusted. Clothing is often allowed to deteriorate much faster than necessary. In short, the idea of maintenance seems to be unknown. Considering the low level of income and the fact that the items subject to most abuse are usually store bought, it seems most important to try to rectify this attitude before even attempting any development programs.

#### The Operations of Baffin Land Iron Mines Limited

##### Discovery and Staking

Northern Baffin Island was first seen by William Baffin in 1616, followed in 1818 by John Ross who went ashore on the north side of Bylot Island and W.E. Perry who in 1819-20 found among others Admiralty, Navy Board and Pond Inlet. It was not until 1923 that Therkel Mathiassen obtained some real knowledge of inland conditions. In fact, the "high, sharp ridged mountain, Nuluijaq", he saw towards the north-east from Inuktorfik Lake was the number one orebody. Pond Inlet Eskimos knew for a long time that its rocks were extraordinarily heavy. Mathiassen on his trip followed for some distance the route now taken by the Milne Inlet road.

Aerial photography of the area was completed during the late '40s. Some reconnaissance work was done by the G.S.C. in 1954 and by the

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Note: The data here given was largely obtained personally from Messrs. E.Black and R. Sheardown of B.I.M., some from Engineering Reports #1 (1963) and #2 (1964) by Watts, Griffin and McQuat Ltd., as well as from recent notes in "The Northern Miner".





Geographical Branch in 1962, in which year some gravity surveys were also carried out in the general area. During the 1962 survey program of British Ungava Exploration Ltd., the major iron ore deposits in the Mary River area of northern Baffin Island were discovered in July on an aerial reconnaissance by Mr. Murray Watts and his pilot, Mr. R. Sheardown. The ore deposits lie on the western flank of the Precambrian Uplands that form the eastern part of the Mary River area. One hundred and seventeen claims were staked in 1962 which are divided as follows over the ore deposits:

Flo - group - 21 claims - covering #1 deposit

Donna - group - 45 claims - covering #2 and #3 deposits

Mary - group - 6 claims - covering #4 deposit

Muriel - group - 45 claims

An additional 264,505 acres were acquired under prospecting permits in 1963. The properties now held by B.I.M. cover all known high grade outcrops, the strike extensions of these occurrences, and the surrounding areas within which considerable low grade iron formation either occurs or is inferred from airborne magnetic survey results.

#### General Geology and Glaciation

Most of the area is underlain by a metamorphic complex of precambrian gneisses and granites which occupy the upland areas but are in the low land areas extensively overlain by younger flat-lying sandstones and limestones. The latter might be equivalent to the relatively underformed proterozoic sand and limestones reported at the head of Milne Inlet and Tay Sound, but have recently been tentatively related to the Ordovician "Gallery Formation" in the Admiralty Inlet area. Near Sheardown Lake, local grit and conglomerate beds in sandstone contain 1/8" to 3" pebbles of high grade hematit similar to that in the deposits. Definite granitic intrusives and pegmatite dykes are everywhere uncommon.

Within the granitic complex occur narrow bands of sedimentary rocks which are also metamorphosed and usually display gneissic structure. These bands vary from a few tens of feet to half a mile in width. They can, in some cases, be traced for many miles in length. In them, quartzite, graywacke, arkose, silicate formation and banded iron formation have been recognized. Basic intrusives including gabbro dykes and serpentine sills occur, but have not yet been investigated in detail due to insufficient exposure.

The high grade iron deposits are the only mineral occurrences of economic interest so far known in the area. They are associated with the banded iron formation of the sedimentary belts. Compared to the Canadian mainland, ice recession on Baffin Island appears to have been quite recent, perhaps within the past 200 years. This is evident from the snow fields and ice caps that still exist in the mountainous regions in the eastern part of the island. Further evidence of recent ice retreat are the thick, unconsolidated deposits of glacial till that lie undisturbed on the slopes and hillsides despite the lack of vegetation to inhibit soil erosion.





Figure No. 33: Baffinland Iron Mines - view along ridge of No. 1 Ore Body.

Figure No. 34: Baffinland Iron Mines - end of No. 1 Ore body dipping towards camp.



### Location, reserves and geology of orebodies

The largest and most important occurrence of ore is deposit #1. It is about 1 1/2 miles east of base camp (Lat. 71° 19' N, Long 79° 21' W). It consists of a folded, steeply dipping -77° to east-tabular body of hard hematite and magnetite, outcropping intermittently over a strike length of 8,200 feet along the crest of a ridge 2,310 feet above sea level. The relief between the top of the deposit and the lowlands nearby provides a vertical exposure in excess of 1,400'. Widths vary from 70' to 380'. The maximum continuous exposed width is 230'.

In the summer of 1964, the #1 ore body reserves, amenable to exploitation by conventional open-pit methods, amounted to 127.7 million tons of high grade hematite and magnetite within 800' of the highest point, or an average of 385' below 1,900' elevation and over a strike length of approximately 5,000'. This leaves 2,300' of actual strike exposure or about one third of the total as yet untested for depth extension. This tonnage is subdivided as follows:

87.6	million	long	tons	hard	high	grade	with	68.65%	soluble	iron	+	.78%	silica
20.7	"	"	"	friable	high	grade	with	67.55%	"	"	+	.49%	"
19.4	"	"	"	hard	silicious	high -	"	64.50%	"	"	+	3.31%	"
				grade									

Impurities were very low throughout.

By the end of the 1965 season, published drilled off reserves had increased to 187 million long tons with an average grade of 69% total iron. The ultimate reserves of high grade ore will probably turn out to be a multiple of this figure after drilling is completed along strike and down dip.

The potential of this ore body in the drilled portion is about 320,000 long tons of 68% soluble iron and 1% silica per vertical foot below the 1,500' above sea level elevation. In the undrilled portions the potential of the North Limb Extension is 84,200 long tons per vertical foot of 70.62% total Fe with .71% silica. The potential of the South Limb Extension is 37,600 long tons per vertical foot of 62.91% total Fe. and 2.97% silica. No systematic drilling has yet been done on any of the other ore bodies, so only an estimate of their potential can be given.

Number two ore body is predominantly of high grade specularite, outcropping on a 2,000' long ridge 1 1/2 miles east of number one ore body. The largest continuous outcrop is 150 feet in length and it has an inferred width varying between 20 feet and 230 feet and dips 800 feet to the north. The potential is 20,000 long tons per vertical foot, averaging 68.0% total Fe. and 2.13% silica.



Number three ore body, of high grade hard hematite, crops out over an area of 340 feet by 350 feet on a side slope 2,200 feet south of number two ore body. It dips  $75^{\circ}$  to the north. Its potential is 15,000 long tons per vertical foot grading 68.1% total Fe and .56% silica.

Number three A is a massive high grade mixed magnetite - hematite occurrence about 5,000 feet east of number three. The exposure measures 75 feet by 600 feet striking north-east and dipping  $70^{\circ}$  to  $80^{\circ}$  to the north. The potential is 5,500 long tons per vertical foot. grading 68.7% total Fe and .83% silica.

Number four deposit crops out along a low ridge approximately 15 miles north-west of #1 deposit. It is quite close to the haulage route to Milne Inlet and consists of massive high grade ore in which magnetite and specularite dominate. The exposures form a series of elongated lenses intermittently over a strike length of 7,800 feet and with a width of 50 feet to 250 feet. Combined surface exposures amount to about one million square feet. The potential is 125,000 long tons per vertical foot averaging 66.8% total iron and 2.06% silica.

The above ore bodies are made up of the following main ore types:

(1) Magnetite High Grade

This consists predominantly of massive, fine grained hard metallic iron, highly magnetic and at times a natural lodestone. It contains hardly any significant impurities but there are traces of pyrite and occasionally chalcopyrite, and in some areas chlorite garnet schist bands are contained within the high grade massive magnetite. The most common associated mineral is hematite and at some localities the ore grades from magnetite to magnetite - hematite to hematite. The magnetite high grade appears to be primary metamorphic iron oxyde, presumably formed during regional metamorphism.

(2) Hematite High Grade

It is predominantly massive, fine-grained and hard, often openly porous with fresh iridescent hematite crystals projecting into pores and vugs. It contains little visible impurities. Proportionately, hematite far exceeds magnetite as the major high grade mineral. Hematite is mainly pseudomorphic after magnetite and appears to be a product of late stage oxydation accompanying metamorphism.

(3) Specularite High Grade

It is mainly coarsely granular to micaceous and generally quite friable. Its appearance is steel blue with a brilliant metallic lustre and considerable surface iridescence and is made up of almost pure massive specular hematite with only traces of quartz impurities. Massive specularite occurs in varying amounts in all of the high grade deposits. Specularite probably developed from high grade magnetite at a late stage and its formation was controlled by local differential oxygen potentials

#### (4) Banded Iron Formation

They are typical itabiritic iron formations with 1/8" to 1/2" interlaminated quartz and hematite on magnetite. Occasionally, one inch to two foot bands of pale green chlorite schist occur within these iron formations. The formations have an average grade of 25 per cent soluble iron, varying from 10 per cent to 55 per cent. It is widely distributed in all important areas and is easily detected by air-borne magnetics and could lead to new high-grade deposits. It shows structural characteristics of true sedimentary rocks, though there has been a high degree of alteration.

#### Nature of Climate and Country

The outstanding fact about the climate of the area is the low precipitation. Annual snowfall averages less than three feet, i.e., 3.6" moisture. Snowfall is heaviest in September, October and November and less than 2.5 inches each month for the rest of the winter. During the winter, south-easterly winds predominate, with moderate sized drifts forming on the north-western sides of buildings. Only during May, is there a fair amount of cloudy weather, fog and storms. During the other months, clear weather predominates. At all times, there may be considerable variations between Number 1 deposit and the base camp. (For summary of Mary River weather records, see Appendix IV.

A comparison of long term weather projections for Mary River (data interpolated from Arctic Bay) with data from Knob Lake shows that though Mary River is colder in winter than Knob Lake, monthly means from June to October are within 10°F of each other. The summers at Mary River are thus only slightly cooler than at Knob Lake, though the latter is 1,500 miles to the south. Since the precipitation level at Mary River is only about 1/5 th of that of Knob Lake (or Toronto), from a work or habitation comfort standpoint, there would not be too great a difference in spite of the colder winters.

Considering the latitude, the temperature difference in winter is not extreme and precipitation is considerably lower. The long daylight period from April to October, the frequent sunshine, low winds, low precipitation and narrow daily temperature spread all contribute to the stability and habitable nature of the climate during the summer.

The countryside surrounding the main camp in the summer has a pleasant appearance of gently rolling meadows with the main deposits rising steeply in the background. Small herds of Peary caribou were observed several times in the vicinity and there are hares, white fox and lemming. Within walking distance are several good spots for sport fishing. During the summer narwhales are plentiful in Milne Inlet.



### Harbour Location, Shipping, Road and Railroad

After the first assessments of the discovery had given an indication of grade and tonnage potential, it was realized that shipping would present one of the most difficult problems. In choosing a harbour site an attempt had to be made to maximize length of shipping season and to try to keep the cost of overland transport to a minimum. The relative merits of various possible sites in regard to length of shipping season are given in Table XI from "Navigation Conditions to Harbours in North Central Baffin Island" by Moira Dunbar of the Defense Research Board:

Table XI

#### Comparative Shipping Seasons in Weeks

Harbour	Strengthened Ship and Ice-breaker			Strengthened Ship			Unstrengthened Ship		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
Milne Inlet	8.25	10	7	7.5	9	6	5	6	4
Tay Sound	9.25	10	8	8.25	9	7	5.25	6	5
Cambridge Fiord	12*	14*	8*	11*	13*	7	6	9	2
Steensby Inlet	9.25	10	6	7	9	4	2.8	5	2
Buchan Gulf	14.4	17	12	11.4	15	7	6	9	2

\*Estimates only

Of these locations, only Tay Sound and Milne Inlet could be seriously considered. The others require too long overland routes through extremely rough country. Tay Sound was eliminated because the Tay route would cross poorly drained boulder till and some high country with considerable snow problems. Though the season at Milne Inlet would be a little shorter and the road only ten miles longer, the Milne Inlet route would pass along well-drained, sheltered valleys close to good sources of fill material.

Construction of harbour, loading and storage facilities at the head of Milne Inlet would not pose any great difficulties. To handle the contemplated tonnages during the relatively short season, these facilities would have to be as large as any in the world today. Even at an annual production of 2.5 million tons, <sup>200</sup>loading facilities would have to be designed for a flow of 7,000 tons per hour at bulk densities of up to 200 lbs./cu. ft. Stock piling facilities would have to be provided for up to four million long tons. At present, it is envisaged that ores would be trans-shipped at Godthaab. Approximate shipping distances to potential consumers are given in Table XII (alternative routes in brackets).



Figure No. 35: Milne Inlet - F.R.B. Camp

Figure No. 36: Milne Inlet - view from prospective harbour site.





Table XIIApproximate Shipping Distances for Baffin Iron Ore

Milne Inlet - Godthaab	- 870	Naut. miles
Godthaab - Sydney, N.S.	- 1185 (1403)	"
- Philadelphia	- 2248	"
- Rotterdam, via North Sea	- 2174	"
- Rotterdam, via Channel	- (2270)	"

At present, heavy cargoes to be shipped to the area are assembled at Montreal late in August for shipment by light coastal vessels of 300 to 400 ton capacity, which require a sailing time of ten days. Milne Inlet is generally ice-free August 1 to September 20. Average tides are 4.7 feet and during the open water season, clear and calm weather generally prevails. Soundings showed that there is a deep water channel suitable for the largest ocean going bulk carriers in operation, under construction or in the design stage. Un-obstructed depths of over 100 feet are found as close as 100 ft. from shore

At Milne Inlet, unloading, lightening, handling and storing of such loads has so far been accomplished in a minimum time per load of 30 hours by a crew of two whites and eight Eskimos.

Present cost of shipping 300 to 400 ton mixed lots from Montreal to Milne Inlet is \$125.00 per long ton, including handling at Montreal. Cost of handling at Milne Inlet is an additional \$5 per long ton. Also to be added is the cost of all-risk marine insurance of .8% of cargo value. For larger shipments, quotes by a Danish firm for Montreal - Milne Inlet were:

<u>Cargo Capacity</u>	<u>Charter Rate</u>	<u>Rate per Long Ton</u>	<u>Load and Discharge Allowance</u>
4,400 long tons	\$85,000 U.S.	\$19.30 U.S.	12 days
3,700 "	\$76,000 U.S.	\$20.50 U.S.	11 days
3,200 "	\$70,000 U.S.	\$21.90 U.S.	10 days

Present cost of shipment by sea from Montreal to Hall Beach is \$100 per long ton to which has to be added a cost of \$120 per ton from Hall Beach to Mary River by air.

The temporary road connecting Milne Inlet and Mary River was completed in 1965. So far the Government has contributed \$10,000 out of the Tote Trail Program towards its construction. The road has a total length of 67 miles and follows gently rising stream valleys underlain by extensive sand and gravel deposits.

The proposed railway will presumably follow the same route.

Present Camp and Facilities; Communications and Transportation

The main camp is located about one mile north of the Mary River and two miles west of No. 1 ore body on the shore of Sheardown Lake at latitude 71° 19' N. and longitude 79° 21' W. The nearest point of permanent habitation is Pond Inlet, about 90 miles N.E. of the property which has a population of about 300 Eskimos and whites. It is the main source of Eskimo labour and a source for emergency and small hardware supplies from the local Hudson's Bay Company store. For the initial phase of the development work, the nearest supply staging point was Hall Beach, 180 air miles to the south, which offered complete facilities for a work force of 300 to 400 and 5,000 foot gravel airstrip. Hall Beach is serviced commercially once a week from Montreal by DC 4 or Superconstellation. The nearest alternative point would have been Frobisher, 600 miles to the south-east.

Some relevant air transportation costs are:

Table XIII

Relevant Air Transport Costs

<u>From</u>	<u>To</u>	<u>Aircraft</u>	<u>Base of Quote</u>	<u>Cost ¢/lb.</u>
Montreal	Frobisher	DC 4	charter	26
		DC 4	small lot	34
Montreal	Hall Beach	DC 4	charter	30
		DC 4	small lot	30
Hall Beach	Mary River	DC 3	charter	21
		Otter	charter	30
		Cessna 180	charter	60
		Beaver	charter	45
Montreal	Mary River	DC 4	charter	36
Hall Beach	Montreal	DC 4	sample rate	16

In 1963, charter costs by DC 4 to Mary River were 6¢/lb. from Hall Beach and 15¢/lb. from Frobisher. The full-time charter of a Cessna 180 at \$100 per hour worked out to 60¢/lb. for Hall Beach.

For the past two years, a 5,000 foot ice strip served very successfully at Mary River.



Table XIV

Distances by Air and Directions  
to  
Some Important Points from Mary River

	<u>Miles</u>	<u>Azimuth</u>
Frobisher Bay	600	146°
Montreal	1,795	176°
Toronto	1,895	182°
Igloolik	140	203°
Arctic Bay	170	317°
Asbestos Hill	670	165°

The Company is at present operating four camps during the operating season at Hall Beach, Mary River, Milne Inlet and Deposit No. 1.

At Hall Beach the company owns a small truck for commuting to the airport and a 20 x 60 foot prefabricated building which can house 20 men, which is used primarily as transit quarters. The camp at Mary River consists of a 16 x 24 foot kitchen, a 12 x 12 foot warehouse, and a 12 x 12 foot generator shack built of lumber and plywood, a 16 x 20 foot office, a 16 x 24 foot garage, a 16 x 20 foot warehouse and three 16 x 20 foot sleeping tents of 12 oz. canvas on lumber frames. With the exception of the garage, all the floors are made of plywood. At No. 1 deposit are two 14 x 20 foot plywood buildings. One serves as a kitchen and the other as sleeping quarters for six men. At Milne Inlet there is a 16 x 20 foot plywood building with limited cooking facilities, sleeping facilities for four to six men and a small office shack.

For land transport there are at present:

2 Autoboggans	OE16
1 Bombardier	J5
2 Bombardiers	M7
2 Catterpillars	D6

An Autoboggan with attached sleigh can, on hard snow and reasonably even ground, handle loads of 1,000 lbs. at up to ten miles per hour. An M7 with trailer can haul three tons. The M5 with trailer can haul one and a half tons. The latter, however, proved quite unsuitable for soft snow or boulder strewn terrain. During the spring of 1964, the two D6 tractors pulling three sleighs each moved 300 tons of cargo from Milne Inlet over 65 miles of temporary road to base camp. With a combined average load of 17 tons per trip, a caboose on the sleigh with sleeping facilities for the off-duty operator, and four operators on 12 hour on and 12 hour off duty, the round trip time which had been four days the previous season was reduced to 48 hours.

At the base camp there is an SB - 100 Spilsbury - Tindall 100 Watt radio telephone providing a link with the regular Bell Telephone tropospheric scatter system. The installation is equipped with six channels, double aeriials cut for each frequency, on 40 foot masts and oriented for optimum signal propagation. The company-owned Cessna - 180 (CF - ORO) carries H.F., V.H.F. and A.D.F. radio equipment with DEW line, D.O.T., Company and Bell Telephone frequencies.

Local radio work is done on the assigned frequency of 4,356 Kcs on an SB - 100. For an emergency stand-by unit and for various scheduled contacts, there is a battery-powered 30W Spilsbury - Tindall TRT - 300 with crystals installed for 5,295 Kcs - DEW line; 5,850 Kcs - Department of Mines and Technical Surveys field parties; 6552 Kcs - ground to air; 4,356 Kcs - local company traffic. For the use of company field parties, three transistorized portable S & T - PRT 20B's of two watts proved to be very reliable within recommended distances but have intermittently been used with 5 - 10 per cent efficiency over distances several times as far.

At present there is at the base camp an airstrip 5,500 feet long by 150 feet wide, to be enlarged to 6,600 x 200 feet. At mile 30, there is a secondary strip and another 5,000 foot strip at Milne. Federal assistance included \$40,000 towards the construction of the strips at Mary River and at Milne Inlet.

#### Production and Townsite Plans - Employment and Development Potential

Companies at present participating in Baffinland Iron Mines Limited are: Anglo American Corporation of South Africa, Hudson Bay Mining and Smelting, Madsen Red Lake Gold Mines, Advance Red Lake Gold Mines, Asbestos Corporation, Consolidated Mining and Smelting, and Westfield Minerals. At present, no stock issues to the public are anticipated. Baffinland Iron Mines Limited has so far spent well over one million dollars on exploration and development.

It is now thought that No. 1 deposit could be brought into production with conventional open pit mining, preparation, handling and transporting methods and equipment at a minimum rate of 1.5 million long tons per year. A more likely starting rate would be 2.5 million long tons per year at which production equipment would be required for a rate of 17,000 long tons per day on a 24 hour, 150 day basis. The balance of the year would be required for stripping and maintenance. Production could be stepped up in stages to five and later 7.5 million tons per year. It is now thought that production might start by 1970. The Northern Canada Power Commission has planned a field investigation into the hydro-electric potential of the Pilik - Inuktorfik Lake area - approximately 15 miles from No. 1 ore body.

For a townsite there is good ground along the east and south shore of Sheardown Lake. The well-drained, coarse gravel terraces offer ideal conditions for construction. Present employment during the development season is only about 80, including ten Eskimos who come from Arctic Bay,



Pond Inlet, and the Igloolik area. It is anticipated, however, that even in the initial stages of mine development and production, direct permanent employment at Mary River would be between 500 and 600, half of which would probably be Eskimos. A smaller satellite settlement would develop at the harbour site.

Apart from the benefits that would accrue to the local economy from direct employment through steady and relatively high wages, improved schooling and training facilities, etc., we have to keep in mind, with regard to the importance of the Mary River project for the general development of the area, the multiplier effects of this direct employment as well as the influence that anticipated lower fuel and power rates and the availability of low back haul rates, by sea for incoming and by air for out going cargo, would have on the feasibility of subsidiary industries.

## Chapter VIII

### SOME GENERAL CONSIDERATIONS ON SOCIAL AND ECONOMIC CHANGE

Before drawing any conclusions regarding the policies that might be most beneficial to the Iglulingmiut socially and economically and before suggesting means by which such policies might best be implemented, a short summary will be given of some of the more important general considerations which are relevant to the problem. If we accept as an initial proposition that the present situation in the area is one of social and economic disequilibrium - and this point can hardly be disputed - then the questions to be asked are:

- 1) What factors characterized the previous equilibrium situation?
- 2) How was this equilibrium disturbed?
- 3) Which of the past changes are irreversible?
- 4) What can we say about necessary conditions of any new equilibrium?
- 5) Which surviving aspects of the old equilibrium situation are incompatible with any new one?
- 6) What principles must therefore guide our policies?

With the aid of some quotes from contemporary literature, the ideas on some basic relationships between culture, environment, technology and economy which guided the derivation of the conclusions can perhaps be best illustrated.

In a slightly different geographical context - the spread of western European culture across temperate North America - J.C. Malin, stressing the importance of technology said:

"The earth possessed all known and yet to be known resources, but they were available as resources only to a culture that was technically capable of utilizing them".

This can for our purposes be interpreted as implying that wherever a traditional culture is a function of, by our standards, inadequate technology, that culture must change to the extent that technology improvement in the interest of better resource utilization demands. Another very important distinction between an adequate resource process by modern and by traditional standards - with the stress on the economical factor - was well characterized by Firey:

"Present day resource processes..... are quite literally an artifact of the European and American market economy. In such an economy human agents are governed by the norm of maximizing private gainfulness in their production and exchange activities. The consequences of such a norm, as far as resource processes are concerned, is a geographical specialization of productive activities; what people do with their land is dictated, not by their subsistence needs, but by what they can get in exchange for their products."



And further on resource planning:

"Resource planning is either revolutionary or reactionary. Either it is part of an effort to build a new social order or it is part of an effort to bolster an existing social order. Programs of resource development, for example, are going to call for new social forms; programs of resource conservation, on the other hand, are going to strengthen old social forms. Hence, once we have recognized that resources have a social as well as a 'natural' aspect, it becomes evident that any change in one will be a change in the other. Likewise, any constancy in one will be a constancy in the other."

What has above been referred to as a social and economic equilibrium situation is more or less identical with the more rigorously defined concept of anthropological climax as elaborated by Tansley and Firey. This was derived from ecological theory, initially as:

".....the stage at which there is such an association of plants and animals as can perpetuate itself in that habitat throughout the course of a given climatic regime."

When the human factor is introduced, this definition is extended to read (Tansley):

".....the particular stabilization of plant and animal associations that ensures a consistent and prolonged type of land-use by man."

Firey then gave the term a more inclusive definition, which reads:

".....that particular association of plants and animals which is able to perpetuate itself in a habitat throughout the course of a given type of human occupancy. Anthropogenic climax thus defines a subset of optimum resource processes within the more inclusive set of possible resource processes, which is best given the normative proposition that maintenance or extension of certain resource processes is desirable and the premise that equilibrium with environment is a necessary condition for such maintenance or extension."

Any economic activity taking place in any region....and in this sense even subsistence on welfare is an economic activity...is a possible resource process but among all the possible resource processes the goal of resource planning must be that subset of optimum processes that would be compatible with a new long-term equilibrium situation. As it may be taken for granted that, even if it were possible - which is extremely doubtful - a return to a traditional way of life representing a social and economic equilibrium with the low material standard of living it entails and its concomitant high incidence of starvation and accidental death is unacceptable to the Igulingmiut and to southern white society, the need for economic development programmes is established. Given that, however, we have to remain aware of an important relationship between

change and unemployment, very clearly and definitely stated by M.V. Hermann:

"It is impossible to have economic development without changing peoples' residences or habits of life and without causing unemployment. Curiously, when given the choice among the hardships of unemployment and change, millions have demonstrated by their actions that they consider unemployment the lesser evil... Which is more important to a human being, to keep his stomach full, or to be able to live in his old accustomed ways?"

Though the millions he refers to live in the tropical zone, given the apparently universal human tendency to resist changes in their mode of life, we have to expect a similar negative attitude, which may often be disguised by reference to traditional culture values, in much lesser numbers but possibly among a significant proportion of the people we are here concerned with.

Another important factor likely to inhibit development is the maintenance of strong ties among members of the extended family group.

"If any member of such a family makes money, he is subjected to unpredictable commitments to a large number of his kin". (Hermann)

Finally, we have to remember that continued dependence upon a large proportion of welfare income for the maintenance of present living standards carries its own danger - the growth of a "welfare mentality" which has been defined as:

"...an attitude in deference to which anyone who is faced with a problem will look for someone to pay the bill rather than try to solve the problem by his own means. Once a welfare mentality has become prevalent, self-reliance is gone and with it energy and resourcefulness. As a corollary, people have become accustomed to talk of their 'needs' as if needs were something absolute and final which somebody somehow has to satisfy." (Hermann) \*

Summarizing the above, we may define our goal as the re-establishment of an equilibrium situation at an economical optimum higher than the previous one. This implies massive cultural change as well as ecological re-adjustments. After this theoretical digression, the questions posed at the beginning of this chapter can be dealt with.

- 1) The late Thule culture prior to the beginning of large-scale whaling by whites probably represented the last period of anthropogenic climax, i.e. ecological, ethnological and economical equilibrium, in the area. The governing factors were the availability of whales, the technological means of hunting and securing them as well as other sea-mammals and caribou according to season, a community structure within which close ties among members of the extended family played a positive role, and which was suited to the organization of whale hunts and finally a pop-



ulation density and distribution and a hunting pressure which did not endanger the survival of any major species. This way of life and degree of resource exploitation had clearly been able to perpetuate itself for the prolonged period assigned by archaeologists to the Thule culture. (1200-1700 A.D.)

- 2) This equilibrium was initially disturbed in its ecological aspect by the gradual extermination of the Greenland whale. Adjustments in the ethnological and economic aspects began with the break-up of the large Thule settlements and a re-dispersion of the population. A new stable equilibrium, however, could not develop as new factors - technological and economical - were introduced at a rate that precluded their gradual absorption by native communities into their material culture. The most important of these factors were the introduction of firearms, of new materials, new types of boats and a fur-based exchange economy. These constituted  
 "....changes in the elements of a resource complex beyond a critical breaking point which represents a transition to a new and different resource system."  
 (Firey)

The breaking point may be defined as that beyond which a large number could no longer survive without the white settlements of Igloolik and Hall Beach. It is here important to note that a stable equilibrium can never evolve on the basis of an economy depending primarily on the fur-market, as the latter is subject to frequent, violent and unpredictable externally generated fluctuations. For that reason, the current pattern of incomes and of outlying camps must be considered as a passing phase.

- 3) The re-establishment of an equilibrium similar in type to the one that existed during the Thule period - which would be the only one compatible with most of the traditional Eskimo cultural patterns and allowing for relatively large settlements is precluded by the higher population density as well as by the higher level of expectations. The changes that have taken place in materials and in tools have made the Eskimos dependent upon our exchange economy and are irreversible. The housing standards introduced by us make large concentrated settlements mandatory - outlying permanent camps will doubtlessly disappear and be replaced by temporary ones occupied only by adult hunters during hunting trips of limited duration. Expectations, which are notoriously hard to lower, are continuously being increased and traditional skills disappear as they become irrelevant to the realization of these new expectations.

- 4) Most emphatically, any new equilibrium must give every individual the opportunity of choosing whether to stay in the region, whether to migrate to other parts of the arctic or whether to move into southern Canadian society. Though we know that the renewable resources of the area could support the local population on the level of the Thule culture - and that was even at its best not too much above bare subsistence level - it is quite unlikely that the renewable resources even with technologically improved methods of exploitation can support the present + population at their present high and still rising level of expectations. The population of the region will no doubt continue to concentrate at Igloolik as the major and Hall Beach as the minor centre and long-term programs for the development of renewable resources at any event will have to take this into account. The possibilities of decreasing the dependence upon the fur market by eventually establishing reliable sources of steady income also increase with the size of the available labour pool. To enable individuals with the desire to improve their condition to do so by their own efforts, the nuclear rather than the extended family will have to become the social and economic unit and the idea that ownership of capital goods carries with it certain obligations towards these goods will have to become rather more widely established.
- 5) What has been said above indicates quite clearly which of the surviving aspects of the former equilibrium situation - all of which relate to cultural values - must be incompatible with any new one and must, therefore, eventually be abandoned if a new equilibrium is to be reached at all. Without here trying to indicate their logical relationships or relative importance, they may be roughly summarized as follows: Too close extended kinship ties; careless attitude towards material possessions; improvident treatment of resources during periods of plenty and subsequent fatalistic attitude when scarcity strikes; insistence upon maintenance of full family mobility after moving into a settlement; seasonal movements of whole family units; ties to burial places of kin; last but not least fluency in the English language will be of the greatest importance to the growing generation and far more important than their knowledge of Eskimo if they choose the realization of their material expectations - whether by outright migration to the south to integrate into southern society or by what Hoover calls 'exploitation of external resources' - rather than the continued adherence to a traditional way of life. Such a choice must be made freely by each one but the necessity of making such an un-



equivocal decision must be convincingly explained by us.

- 6) Any policy of economic development will have to be based on principles established with full awareness of the paramount fact that under present conditions local renewable resources can definitely not be developed in the short run to support the local population at a reasonably stable standard of living comparable to that of southern Canada and quite possibly not even in the long run. It also has to be continuously kept in mind that the pressure for speedy economic development and the resistance to cultural change are counteracting forces. Any policy must therefore be a compromise attempting to strike:

".....a happy balance between the forces of custom and the forces of economic enterprise". (Tawney)

Any program of development aid will have to be administered in such a way that it does not:

".....solidify undesirable attitudes and thereby retard the recipients' attainment of anything worthwhile."  
(Hermann)

The choice remains with the individual Eskimo between his traditional cultural values which may give him:

".....peace of mind and serenity which cannot be won by action and secular ambition....."

and the material values of our civilization, which it is said

".....makes people poorer because it multiplies their wishes and does not soothe, but kindle, desire (in pursuit of which) all the busy doings of hardworking men provide neither happiness nor quiet....."

Here it is not our job to value but to:

".....provide (the Eskimo) with all the information he may need with regard to his valuation." (Last quotes from V. Mises)

i.e. to show which means are appropriate to which ends. As some Eskimo will choose one way and some the other and as, furthermore, most of them will for a long time remain unaware of the import of their choices, policies must provide for appropriate assistance to both groups and must be flexible enough to accommodate those who will change their mind at a later date. But though allowance should be made for the choice by some of a relatively traditional way of life, and though in the short run such a choice should not be discouraged in order not to amplify immediate administrative problems, we should refrain from deliberately encouraging it in the long run by referring in any pronouncements to any cultural values of the traditional way of life categorically as positive. This is necessary because as process changes accelerate with time, any attempt to preserve primitive traditional culture as observed at one specific point in its evolution must in the long run work against the interests of the whole group and so only compound the problem at a later date, which makes it preferable to put up with some disorientation

here and now.

The specific conclusions and recommendations derived from the material presented in the preceding chapters by application of the theoretical considerations given in this one will be outlined in the following chapter.





Figure 37: Eskimo Children, South Camp      Photograph courtesy  
Mr. K. Crow.

Figure 38: Eskimo Girl Guides, Igloolik



## Chapter IX

### CONCLUSIONS AND RECOMMENDATIONS

Since conclusions and recommendations are closely connected due to the nature of this study, they will be dealt with together instead of in separate chapters. A division will be made, however, between recommendations directed toward immediate amelioration of specific local and individual problems and those directed towards removal of the causes of those problems. The former will have little or no drastic effect upon basic social and community structure, or upon overall income patterns. They should, however, be implemented with the absolute necessity of a change in these patterns firmly in mind. The latter, on the other hand, are aimed specifically towards eventual complete integration - socially, culturally, and economically - of the Eskimo into the framework of Eurocanadian society on the basis of the inescapable conclusion, in the author's mind, that the negative answer given by A.F. Flucke to the two questions, "Does the Arctic need the Eskimo?" and "Does the Eskimo need the Arctic?" has to be emphatically reconfirmed in the light of this study. In this context, the absence of recommendations for further studies of a social, anthropological, or historical nature is justified. They are considered to be irrelevant as far as the frame of reference of this survey is concerned. It is not disputed that such studies might be of some academic interest but the fact that improvement of the material standard of living has been specified as the purpose of the study implies the basic value judgement that improved material well-being is a desirable end. To reach that end, traditional Eskimo culture is an inferior - in the sense of less efficient - means than what we refer to as Western European culture. The historical evidence is quite sufficient that (a) traditional Eskimo culture is similar to that of Western Europe many thousands of years ago and (b) that Western civilization made possible the material standard of living that is now considered desirable for the Eskimo precisely because it developed beyond that stage and shed its cultural trappings in the move from stone age to bronze age society. For that reason, further studies of social framework of traditional Eskimo society would be a waste of effort as far as the stated purpose of development policy is concerned.

With a view to the short term desirability - from an administrative point-of-view - of slowing down the camp-to-settlement movement, short term recommendations are separated into those designed to be implemented at outlying campsites and those to be implemented at Igloolik or Hall Beach. As some long term plans will be materially affected by the final decision on whether Baffinland Iron Mines will be developed or not, long run recommendations have been separated on the basis of this criterion. Naturally, many of the short term recommendations can be expanded or incorporated into long term ones, which is desirable in the interest of continuity. Though some recommendations have been mentioned in the



body of the report, they will be repeated here to indicate their relation to the overall picture. It should here be re-emphasized that the following suggestions which were based on survey findings, reflect the author's opinion and not necessarily Departmental policy.

#### Short Term Recommendations - Camps

It is suggested that the basic aim should be the stabilization of the food supply and a limited increase of cash incomes through such adjustments in traditional activities as will help the people at a later date to integrate fully into the then functionally far more specialized economy of the main settlements.

(1) Observations of seal hunting practices indicate that in all camps the introduction - or wider use - of seal nets and seal hooks should be encouraged in the interest of cutting down operating expenses and improving efficiency. This should be done under close supervision of a Projects Officer to be stationed at Igloolik who will, however, also be responsible for the proper implementation of a number of the other recommendations.

(2) It was observed as well as heard in conversation that in hunting from canoes there are frequently not enough harpoons and floats available. This situation should be easy and inexpensive to rectify, as there was much suitable scrap lying around at Igloolik and Hall Beach. The Projects Officer should stress the advisability of using one's eyes before spending one's money. (3) For whales or walrus the idea of a hunt organized around a large boat with specialization of functions of the men taking part in it, <sup>should be</sup> carefully and thoroughly developed. Canoes should be used only in a supplementary role for spotting and harpooning, while the carcass should be handled on the large boat to achieve a higher degree of utilization. Long-term development potentials make this project particularly important. The lack of storage facilities for blubber was in the course of the survey most frequently complained of by hunters in camps. (4) All camps should therefore be supplied with sufficient numbers of 45 gallon drums. These are available from the old DEW line sites and could store all blubber or oil rendered from it. At present, a lot of blubber and oil is wasted. Full recovery and the availability of adequate storage facilities could to some extent reduce cash requirements for kerosene, and in view of the large amounts of blubber available in the area a limited market for camp surplus might be developed at Igloolik and Hall Beach.

(5) Based on the experiences in Keewatin, the Projects Officer should teach the camps to smoke caribou meat and char in a tent using locally collected willows. This would not only help to increase the utilization of char and caribou and stabilize camp food supply, but add another source of cash income for the camp population. As the number of Eskimos living in settlements grows, particularly if a new permanent settlement develops at Mary River, there will be a strong local demand for relatively cheap country food, which need not meet the specifications laid down for food products exported from the Northwest Territories. Sale of surplus camp food at Igloolik and Hall Beach would increase the proportion of

food procured by the inhabitants <sup>that</sup> would be available for export after preparation at the facilities suggested later for Igloolik.

- 6) Further to alleviate the need for adequate storage facilities, it is suggested that at each of the remaining camps a frost cellar should be constructed under the supervision of the Projects Officer. The site in each case should be determined in consultation with the camp boss, the area administrator and the RCMP constable. The paper on "Food Storage in Permafrost" by H.B. Dickens gives sufficient guidance. Final costs will depend largely upon the ingenuity of the Projects Officer in charge but should not exceed \$500 to \$800 per installation if local labour and - as far as possible - scrap lumber from closed DEW line facilities is used. In some locations, advantages of blasting the storage chamber out of bedrock should be closely investigated. Again, the effect would be stabilization of camp-food supply and reduction of waste. Furthermore, some of the meat secured in winter can be quick-frozen by pouring water over it and could be sold at Igloolik for processing should the level of local supplies allow it.

The above points apply to all outlying camps. Specific suggestions and additional recommendations for individual camps are given below.

7) Agu Bay

The greatest need was found to be a whale boat or a long-liner to enable the people to hunt White Whales in the western entrance to Fury and Hecla Strait. The best place for stationing the boat would probably be Dybbol Harbour, which might also be the best location of a frost cellar. This place would also be suitable as a base camp for a large organized annual seal hunt in the area, in which the people from Igloolik and Agu Bay should co-operate. A satisfactory sharing of the proceeds of such a hunt must be worked out on the local level. A large boat stationed in this area could be further utilized for moving camps and supplies during the open season and to cut down the number of dog team trips to Igloolik. This would lead eventually to some reduction in the number of dogs required for this camp. Seal nets should be quite productive at Whyte Inlet, Encampment Bay, Nyeboe Fiord and Foss Fiord. The camp should also acquire at least one more canoe with 9½ h.p. motor

8) South Camp

With the delivery of the trap boat already on order, this camp's biggest need would be met. Considering its closeness to Hall Beach with its proposed freezer facilities, the frost cellar for this camp should probably be situated on Amitioke Peninsula or even further south. Seal nets are already being well used by this camp. Additional ones could be introduced with little difficulty. This camp could sell surplus country food directly at Hall Beach. It might be advantageous for this camp to deliver increasing proportions of its walrus catch directly to Hall Beach for processing and to start switching soon to locally prepared dog food. Although this camp could in the short run probably support a few additional families, it should be kept in mind that it will likely be absorbed by Hall Beach in the not too distant future.



9) Jens Munk Group

The frost cellar for this group should be located on Qaersuit Island and the people should be encouraged to land increasing proportions of their catches directly at Igloolik as soon as freezer, storage and processing facilities have been established there. This group would seem to be the most suitable one on which to try for the short run an improved type of camp housing, though in the long run it might be the easiest one to integrate into a fully market oriented regional economy. Members of this group should be able to start using processed dog food from Igloolik as soon as it becomes available in sufficient quantities. If authorized by the Canadian Wildlife Service, a small Eider-down collection project could be started here under the supervision of the Project Officer at Igloolik.

10) Iglugjuak

Interviews with residents indicates that this camp needs at least one additional large boat. A frost cellar might be located at Cape Jensen or north of it in Steensby Inlet. A more detailed study of fish potential should be undertaken (a) of Grant Suttie Bay and (b) of the Erichsen Lake - Ravn River complex. In the latter area particular attention should be paid to the problems connected with the potential development of Mary River. Such a study could be coupled with the introduction of seal nets. If Mary River is going to be developed, the Iglugjuak camp might temporarily be increased and introduction of improved camp housing might be justified. In that case, the camp would be in a favourable position to supply the Eskimos at Mary River with country food. If there is no development at Mary River, this camp might be one of the first ones to disappear because of its isolation, in spite of the good renewable resource base of the area.

11) Naujaguluit

On the basis of survey observations, it is suggested that these people should be moved into Igloolik and the existing shack destroyed, because of its extremely unsanitary condition.

12) Napakut

Survey findings indicate that this camp should be disbanded and the people moved into Hall Beach (those for whom employment can be found) and Igloolik (those that are hard core welfare cases). All existing shacks should be destroyed for sanitary reasons. It is understood that this move is already under way. The small bay may be used as an anchorage for their trap boat until an anchorage can be provided at Hall Beach. One member of the camp at least, who is a good hunter, could be persuaded to join the South Camp with his family.

13) Qiqigtadjuk

It is in the author's opinion, most important that on no account additional permanent housing be put up there. While the people should not be forced to move into Igloolik immediately, gentle pressure could be exerted in an indirect way to induce them to request their houses be

moved into Igloolik. The establishment there of a satellite community in permanent housing would in the long run not only require proliferation of administrative services but also retard long-term economic development. Although it may seem like belabouring a minor point, there are undoubtedly some under-currents in favour of an expansion of that settlement and attempts have to be expected to bring about such an expansion by very little, innocuous steps. Any such steps should be most decisively resisted by the local administration.

B) Short-term recommendations - Igloolik and Hall Beach

Basic aims are the increase and stabilization of the supply of country food, improvements in hunting efficiency and increase and diversification of cash income from local resources. In the implementation of the recommendations the educational component, that is development of a higher degree of functional specialization of activities and increasing monetarization of the local economy should be stressed even more than in camp programs. Considering the population size, the relative wealth of the area and the number of programs to be supervised, it is imperative that a Projects Officer of the highest calibre be appointed. The Projects Officer should be on at least the same level of seniority as the Area Administrator and not under the latter's supervision. They should, of course, co-operate closely.

14) It is felt that in order to improve seal hunting efficiency and total yield, use of nets should be greatly increased. Every spring, a seal hunt should be organized on a co-operative basis to western Fury and Hecla Strait. This could yield several hundred animals. The number of hunters participating could gradually be decreased to a minimum, no more than ten men should be required even for a start. To assure full utilization of skins and carcasses, they should be prepared in the field in such a way as to be suitable for processing for export at Igloolik.

15) Observations and local discussions indicated that walrus hunting by individual parties by canoe should be gradually discouraged and replaced by better organized hunts. This could be under the supervision of the Projects Officer to assure full recovery of the carcasses which should be landed whole at Igloolik or Hall Beach for proper processing. The same should apply to whale hunters. Possibilities of recovering the blood of the animals (see Appendix 1 for total amounts) for potential use, either in dog food or fertilizer, should be investigated by the Projects Officer.

16) Some improvement in the char catch seems possible with a systematic rotation of the fish camps between various rivers. As total catch is not very large, small amounts could be smoked in a tent for local consumption. Salting of char at fishing sites might be introduced on an experimental basis by the Projects Officer, as this method might be very valuable in preparing char from small, dispersed fishing camps for export items should the total yield



increase sufficiently through more systematic fishing operations.

17) Equipment should be purchased by the Co-operative for a small sealskin tanning project for hides to be used for local clothing. (See Appendix II for details). This could provide some part-time work for local people with no or little cash income and would also cut down on cash spent at present for store-bought clothing which is far less suitable for many outdoor activities.

18) The Co-operative should also investigate the economics of purchasing ammunition reloading equipment for use of members.

19) The amount of meat available locally seems to warrant the introduction of a food processing project. This should in the first stage concentrate on the storage and preparation of food for local use and for sale within the Northwest Territories and in the second stage start production of export products as developed already in other settlements. A large freezer would be required at Igloolik and a smaller one at Hall Beach, and a suitable processing shed (there seem to be several buildings around that might be surplus next year) at each settlement, a Wassau Hogger and canning equipment. These latter items could be used at Igloolik and at Hall Beach in turn each season. In the second stage, a proper smoke house might be built at Igloolik. Total meat potential is given in Appendix I. With full utilization of carcasses, a considerable amount of prepared dog food - similar to that now produced at Whale Cove - could be produced in the region, making a higher proportion of good meat available for human consumption. Possibilities of utilizing the considerable amounts of bone, blubber and blood that are available but now largely wasted, should also be investigated.

20) With more people moving into Igloolik and Hall Beach, every attempt has to be made to cut down the number of dog teams. This must be based on persuasion on the part of the Area Administrator of all those whose dog teams have been found superfluous by him after careful investigation of each individual case.

21) After the Projects Officer has some of the programs well under way, a Crafts Officer should be assigned for a half-year period to supervise a program of producing a good grade of sealskin clothing from locally tanned hides for sale in the north to wage employed Eskimos and Whites; of sealskin souvenirs and - if an initial market investigation should justify it - of children's size amautiks for export to the south. This could be combined with the establishment of a community sewing centre and integrated with the adult and vocational training programs.

22) Adult education courses - possibly in conjunction with a vocational training program for the teenagers - are badly needed in skidoo and outboard motor operation and maintenance. A supervised metal and wood

working shop could then perhaps be made available on a suitable basis for individual and community projects.

23) As Igloolik expands, more clerical positions will undoubtedly open up with various agencies, most of which should be filled by local Eskimos. There are a few suitable young men at present at Igloolik who could be easily trained in the area administrator's office.

24) At Hall Beach the possibility of having some of the Whites presently employed at the Airport replaced by local Eskimos should be closely investigated. If necessary, an on-the-job training subsidy should be considered. In the event of an additional telecommunications establishment opening at Hall Beach, maximum employment of Eskimos by the operator should be kept in mind from the first stages of planning onwards.

25) The construction of a small anchorage at Hall Beach, using available equipment, local gravel and local labour, seems possible at relatively little cost. A competent Project Officer should be able to do that with little outside help in one season. The provision of a small anchorage at Hall Beach is quite important in view of the eventual integration of the populations of Napakut and the South Camp.

26) Within the frame of the Co-operative, the present greenhouse facilities, constructed by Father Fournier, could be considerably expanded at little cost. The present greenhouse is an outstanding example of how much can be achieved at the local level at relatively little cost. Local demand at Igloolik and Hall Beach will certainly grow. Local whites particularly would be willing to pay for fresh vegetables and with gradual enlargement of the facilities, expenditures for store-bought canned vegetables could slowly be reduced.

27) Members of the Co-operative expressed interest in some training such as has been given for other co-operatives in fur buying and marketing, auction procedure, fur grading, etc. It is strongly recommended that such assistance be given and expansion of the co-operative's fur marketing activities be encouraged. The desirability of increasing the viability of the local fur market follows from the theoretical argument developed in Appendix III. It is suggested that a Co-operative Development Officer be posted to Igloolik

#### C Long Term Recommendations - Independent of Mary River Development

These are directed toward the development of a fully monetized market economy oriented toward export to the south and based on renewable resource exploitation by modern, industrial methods. Most of the recommendations already made need only slight further development and adjustment to fit into such a frame. As such an economy would only be able to support part of the population, an important proportion of the effort in any long-term program has to be directed towards enabling the other part of the population to exploit external resources.

28) Efficiency and yield of fox trapping could certainly be further



increased. This would mean an initial decrease in the number of trappers and more frequent and systematic patrolling of trap lines by the remaining ones. Trap lines should be laid out to form loops easily patrollable by skidoo. As fur farming in the north has for various reasons proved to be of very questionable practicality it might be worth while to investigate if and to what extent improvement and stabilization of yield might be possible by baiting the loops throughout the year, using meat rejects and possibly so far unutilized aquatic birds, in order to concentrate and stabilize the fox population.

29) A small Eider-down project, operated, under supervision, by the Co-operative, seems feasible and should be carefully investigated.

30) A detailed evaluation should be carried out of the ultimate caribou potential of the area and of possibilities of bringing the caribou population up to optimum size in as short time as possible. Present utilization practices are still somewhat wasteful and there is little doubt that the total yield can be materially increased. Hunting and utilization practices should gradually be adjusted to be better capable of meeting the requirements of production of marketable meat.

31) Considering distribution, size and formation of river systems carrying char, the potential of some of the larger lakes on Melville Peninsula might be worth investigating for commercial trout production. The number and size of suitable bodies of water is considerable and although initial costs of establishing trout in some of them may be rather high, long term operating costs for seeding, fertilizing and harvesting could be low enough if such an operation is started on a large enough scale. Detailed research in all these areas is recommended.

32) A long-term feasibility study should be carried out on introducing musk-oxen into the region, possibly in the Saputing Plain or Gillian Lake areas. That these animals did not establish themselves in the area naturally seems to be due more to historical accident than to ecological causes. Vegetation in many parts of the region should be adequate and seems to be incompletely utilized by caribou alone and a broadening and diversification of potential protein sources as well as the spreading of a rare species over new ranges to which it is suited and where it would not upset the ecological balance seem generally desirable ends.

33) The seal and whale meat canning project suggested in the preceding section could be considerably expanded and diversified in the second stage, in which full utilization of all by-products should be investigated in detail.

34) With the growth of a settlement, the inclusion at the local school of preparatory courses in business and clerical fields for the general

vocational training program should be studied in co-operation between the Department of Northern Affairs and the Hudson's Bay Company to enable the substitution of an increasing number of Eskimos for whites in administrative and clerical positions in the north. The number of such openings in the area might be considerable in the long run and would increase sharply with the development of Mary River. Any specialized vocational courses should, however be left to the training establishment now being planned for Frobisher Bay.

35) A certain number of Eskimos will continue to live in camps and engage in fairly traditional activities for the foreseeable future. Survey findings indicate that the erection in outlying camps of conventional houses is definitely not practicable for sanitary reasons as well as reasons of long-term planning, and it is particularly strongly recommended that on no account houses that are vacated at Igloolik be moved into any outlying camps. Any salvage material should be utilized for projects at Igloolik.

36) The biggest need as far as the camps are concerned is the development of some new type of semi-permanent housing. It should be possible to develop something a little superior to tents in summer and igloos in winter and at the same time less demoralizing than some of the shacks that are still around. Necessary characteristics of such housing should be: inexpensiveness, the cost should not materially exceed the cost of a large tent; some degree of portability - it would probably only have to be shifted twice a year; longer life than a canvas tent and better insulation. Preferably it should have no nooks and corners in which organic refuse can accumulate and decay and it should have no floor. Once erected at a camp-site, it should be possible to move it easily to a new clean space on either gravel or snow. Some types of shelters already on the market made either of rigid plastic panels or of self-rising and hardening urethane foam should be easily adaptable. Desirable design characteristics should be discussed and after being agreed upon, the National Research Council might be approached, who are understood to be already engaged in related projects.

37) From a point of view of present resource exploitation practices, the development of Hall Beach into an administrative centre should definitely not be considered at this time. Igloolik is the natural centre of the region in relation to which Hall Beach should remain no more than a small satellite community. If anything more is developed at Hall Beach the result would only be another Frobisher Bay. Igloolik has a relatively good resource base, capable of long-term development and administrative services there can be gradually increased as the need arises and do not have to be created artificially, deliberately and unnecessarily. Thus the dual function of Igloolik as the basis for local commercial resource exploitation and as a way station in preparing the surplus Eskimo population for the exploitation of external resources can be retained. The growth of a large welfare establishment with all its undesirable side-effects upon economic growth can thus be avoided. In any case, the potential development of Mary River could shift the bulk of many



governmental activities as well as of economic development to that settlement, in which case a further developed Hall Beach would easily be left as an embarrassing white elephant.

38) In the long run most hunting and fishing activities carried out from Hall Beach and Igloolik in the conventional manner will serve an exclusively recreational purpose. In that case and at that stage they could be exploited as a tourist attraction. Present tourist potential of the region - though the attractions are considerable - seems to be severely limited by difficulties of speedy and reliable access. Nonetheless, a tentative study might be worth while even now. In considering tourist attractions, the possibilities of an open air archaeological museum on Igloolik Island might be discussed with the National Museum and the attractions of the avian fauna with the Canadian Wildlife Service and the Audubon Society. After all, many Americans spend a lot of money each year to see, on long excursions to Alaska, exactly the same kind of birds that are so plentiful around Igloolik.

#### D Long-term Recommendations - Involving Mary River Development

39) Should Baffinland Iron Mines Limited go ahead with the development of the Mary River project, the Igloolik region would no doubt provide a considerable proportion of its Eskimo employees. It is important, that as soon as plans are finalized, government and company begin to co-operate on a detailed program designed to maximize the proportion of Eskimo employees. It would seem desirable that for this purpose a senior member of the Department of Northern Affairs be assigned to that specific problem on a full-time basis. Every job being created at Mary River should be analyzed in terms of its potential suitability for an Eskimo and of the specific training requirements. Job training subsidies should be considered on a large scale. It is also important that possibilities of employing Eskimos in lower supervisory capacities be studied from the start and that suitable individuals be selected soon for extensive training. In the long run, it would probably be advantageous to move vocational training courses that are now being considered for Igloolik to Mary River particularly in mechanical, construction and clerical trades.

40) Large scale Eskimo employment at Mary River would considerably expand the local market for food products and various sealskin garments from the Igloolik region. The effects of such a possible expansion should be considered from the start in the detailed project planning for Igloolik.

41) All plans for sewage and water disposal at Mary River should be approved by the Arctic Unit of the Fisheries Research Board in view of the dangers of long-term pollution build-up and its possible effects upon the fish potential of the Erichsen Lake - Ravn River area.

42) With development of Mary River, the more detailed investigation of the fish potential of the Iglugjuak camp area would become especially important, as in that case there could be a case for the development of a small permanent satellite community in that region.

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## APPENDIX I

## AVAILABILITY OF COUNTRY FOOD—IGLOOLIK ECONOMIC REGION

1) <u>RINGED SEAL</u> :		REPORTED KILL :	CA. 4,000	TOTAL WEIGHT :	304,000 LBS.		
		EST. POTENTIAL :	↓ 5,000	— " —	380,000 LBS.		
MEAT AND EDIBLE VISCERA	27 %	OR	82,000	LBS. ACTUAL OR	102,500	LBS. POTENTIAL	
INTERNAL ORGANS	9 %	OR	27,400	- " -	34,200	- " -	
BONE	16 %	OR	47,600	- " -	60,800	- " -	
BLOOD	5 %	OR	15,400	- " -	19,000	- " -	
BLUBBER	32 %	OR	97,200	- " -	121,500	- " -	
2) <u>BEARDED SEAL</u> :		REPORTED KILL :	CA. 150	TOTAL WEIGHT :	69,600 LBS.		
		EST. POTENTIAL :	↓ 165	— " —	76,725 LBS.		
MEAT AND EDIBLE VISCERA	25 %	OR	17,400	LBS. ACTUAL OR	19,200	LBS. POTENTIAL	
INTERNAL ORGANS	9 %	OR	6,300	- " -	6,900	- " -	
BONE	16 %	OR	11,100	- " -	11,700	- " -	
BLOOD	5 %	OR	3,500	- " -	3,800	- " -	
BLUBBER	27 %	OR	18,800	- " -	20,700	- " -	
3) <u>WALRUS</u> :		REPORTED KILL :	CA. 550	TOTAL WEIGHT :	797,500 LBS.		
		EST. POTENTIAL :	↓ 650	— " —	942,500 LBS.		
MEAT AND EDIBLE VISCERA	26 %	OR	207,500	LBS. ACTUAL OR	249,500	LBS. POTENTIAL	
INTERNAL ORGANS	6 %	OR	47,900	- " -	57,500	- " -	
BONE	12 %	OR	95,800	- " -	115,000	- " -	
BLOOD	7 %	OR	55,800	- " -	67,000	- " -	
BLUBBER	30 %	OR	239,500	- " -	287,500	- " -	
4) <u>WHITE WHALE</u> :		REPORTED KILL :	CA. 30	TOTAL WEIGHT	36,000 LBS.		
		EST. POTENTIAL :	↓ 35	— " —	42,000 LBS.		
MEAT AND EDIBLE VISCERA	23 %	OR	8,300	LBS. ACTUAL OR	9,600	LBS. POTENTIAL	
INTERNAL ORGANS	10 %	OR	3,600	- " -	4,200	- " -	
BONE	12 %	OR	4,300	- " -	5,000	- " -	
BLOOD	6 %	OR	2,100	- " -	2,500	- " -	
BLUBBER	30 %	OR	10,800	- " -	12,600	- " -	
5) <u>CARIBOU</u> :		APPROX. KILL :	CA. 460				
		EST. POTENTIAL :	CA. 900				
MEAT AND EDIBLE VISCERA		MIN.	32,200	LBS. ACTUAL OR	63,000	LBS. POTENTIAL	
6) <u>TOTAL</u>							
MEAT AND EDIBLE VISCERA			347,400	LBS. ACTUAL OR	443,800	LBS. POTENTIAL	
INTERNAL ORGANS			85,200	- " -	102,800	- " -	
BONE			158,800	- " -	192,500	- " -	
BLOOD			76,800	- " -	92,300	- " -	
BLUBBER			366,300	- " -	442,300	- " -	
				800 drums oil (45 gall)		1000 drums oil (45 gall)	

NOTE: The bones also contain approximately 8-4% recoverable fat.

APPENDIX IIOPERATION OF AND EQUIPMENT AND MATERIAL REQUIREMENTS FOR SMALL SEALSKIN TANNERY

(This appendix is a summary of an internal memorandum on the same subject, dated November 6, 1961, by Mr. W. Hill.)

Green or salted skins can be processed. They are first placed in a soaking vat filled with cool water until they are soft and pliable. This should take about two hours. They are then taken out and laced into the stretcher frames where all fat and flesh are scraped away. In the tumbling machine, a solution is then prepared made up of water equal in weight to the moist skins to which is added pickling agent LD 1022 equal to 3 per cent of the combined weight of skins and water. The machine is run for five minutes to mix the solution thoroughly. Then 50 pounds moist weight of skins are put in the tumbler and worked for two hours. Next the solution is drained from the machine into a second vat, into which the skins are put and left over night while another load of skins may go through the tumbler. Next morning, the hides are agitated for 15 minutes in the solution they have been in over night.

Next comes the actual tanning process, the preceding pickling process having made it easier for the tanning chemicals to penetrate the skins. A solution is prepared and put in the tumbler. This solution is based on a moist weight of 50 pounds of skins. It is made of 2½ gallons of hot water (130°F) and five pounds of Korean M. The machine is run five minutes to ensure thorough mixing. The solution is then cooled to 75°F after which the skins are added, a third at a time, with 15 minutes running between additions. When all the load is in the machine, it is run for another full hour. To ensure that the tanning is complete, the skins are placed in water of 185°F. If there is any curling or shrinkage, a further 3.5 per cent of Korean M is added and the machine is run for another 15 minutes.

Finally, the chemicals have to be neutralized. The moist skins are drained and weighed. They are then placed in the machine and a small quantity of water at 90°F is added. The machine is started and an amount of bicarbonate of soda equal to 1½ per cent of the total weight of the moist skins is added. Then sufficient water is added to cover the skins, which should bring the contents of the machine to 130°F, and the machine operated for 30 minutes. The solution is then drained and a new solution of Nardol 55 equal to 15 per cent of the moist weight of the skins is mixed with twice its own weight of water at 140°F and poured onto the skins and the machine run for another 15 minutes. The skins are then taken from the machine, drained and hung to dry over night. Next day, the flesh sides of the skins are moistened and they are placed in the tumbler and run for two hours until they are soft. They are then taken from the tumbler and laced into the stretchers to dry. They should be given an occasional scraping with a dull tool to keep them soft while drying. When they are completely dry, they are removed from the stretchers and placed fur to fur and flesh to flesh in bales



for shipment or storage.

The following equipment is needed:

- 1) Shed materials including paint, nails, fans, electric fittings, etc.
- 2) Labour for shed construction approximately two men for three days.
- 3) Two large <sup>size</sup> ~~size~~ vats.
- 4) Junior model Cascade Washer with manual controls.
- 5) Two scrapers.
- 6) Several balls side line.
- 7) 500 feet 5/8th inch diameter hot rolled steel rods for stretchers.
- 8) Primus stove.
- 9) Thermometers.
- 10) One copper bottomed wash tub with lid.
- 11) One scale for weights up to 100 lbs.

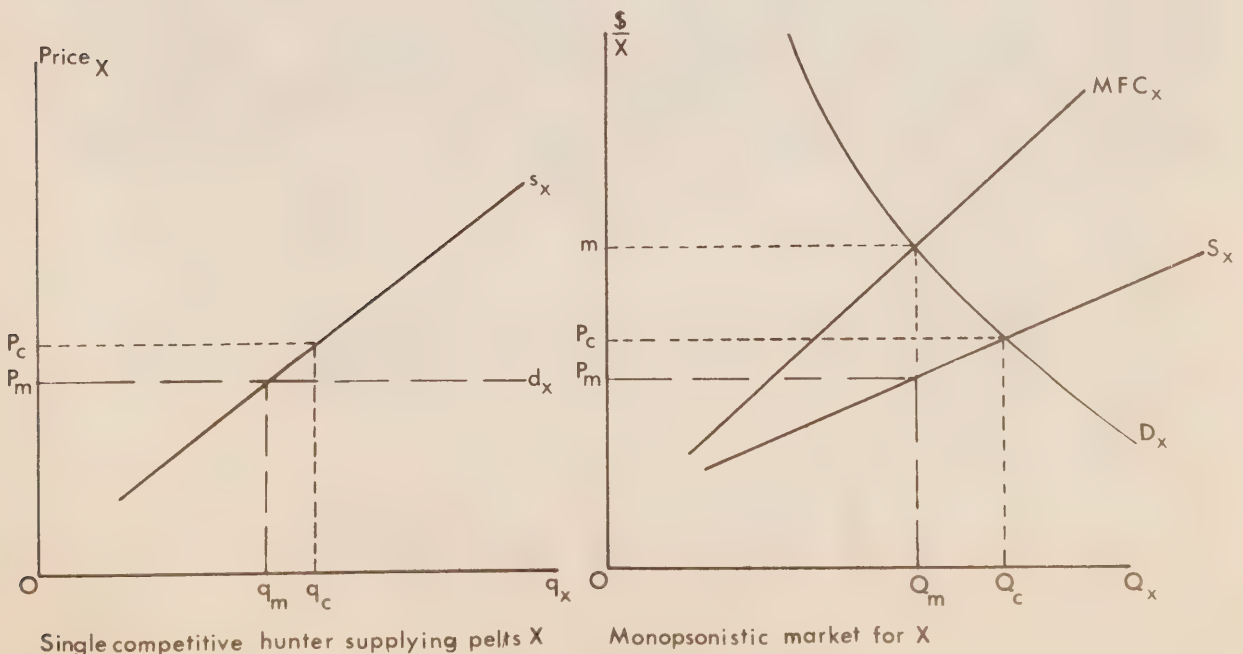
Total costs should be between \$2,000 and \$3,000. Chemicals for 1,000 skins should be between \$200 and \$300.

## APPENDIX III

THE STRUCTURE OF THE LOCAL FUR MARKET

Conditions of fur marketing at Igloolik - as at many other northern settlements - are among the best real-life examples of an economic structure in which a monopsonistic buyer faces a purely competitive sellers' market. The criterion of pure competition here relevant as far as the sellers are concerned, is their inability to influence price. As the subject seems to be of some importance in any consideration of northern economic development, it will be treated in some detail. It should, however, be understood that the following discussion is entirely theoretical, with no reference to actual local transactions or actual market behaviour of local participants. It is intended to show what potentially can happen in such a situation, in fact must happen if the monopsonistic buyer really wants to maximize profits, and why therefore, the establishment of a competing buyer is desirable in any settlement where total business volume allows; particularly if this new competitor represents, as would be the case with a co-operative, a larger organization and would be immune to the attractions of collusion, to which such a basically oligopolistic buyers' market would otherwise be prone.

The monopsonistic buyer faces the entire local market supply curve for pelts—in the graphs denoted by the shape of which in any concrete case would depend upon the cost conditions prevailing in trapping and hunting in a particular season, but which would quite likely be of the general, increasing cost industry, type, i.e. upward sloping with the buyer exercising control over price. To buy greater numbers of pelts per unit of time, the monopsonist must then pay higher prices, or expressed differently, his average factor cost rises with increasing volume. As average factor cost rises, marginal factor cost will at any given quantity be above it rising at a steeper angle. In the right graph, the market supply curve is designated  $S_x$ , the corresponding





marginal factor cost curve  $MFC_x$  and the buyers demand curve  $D_x$ . Through every point on this demand curve of the buyer passes a marginal revenue product curve. If the monopsonistic buyer acts economically "correct", i.e. if he does try to maximize profits by equating marginal factor cost to marginal revenue product, he will buy the quantity of  $X$  at which the  $MFC_x$  curve intersects the  $D_x$  curve, shown in the right diagram as  $Q_m^x$ . He would, however, not pay the price indicated by the intersection point,  $m$ , as the market supply curve  $S_x$  specifies the price at which the quantity  $Q_m^x$  would be offered, which would be  $P_m^x$ . The left diagram shows the individual competitive sellers' equilibrium. As he cannot affect the price, his demand curve  $d_x$  is perfectly price elastic, i.e. horizontal at the established price. With his own supply curve  $s_x$  given, the individual seller supplies  $q_m^x$  pelts per unit of time<sup>x</sup>. The monopsonistic profit to the buyer is equal to the area  $m-p_m$  times  $O-Q_m^x$ .

Under competition, the marginal cost to the buyer would be equal to the price of the resource, i.e. the  $MFC_x$  curve would be identical with the  $S_x$  curve and - providing that market demand and market supply curves stayed the same which they would not necessarily do if competition is introduced - the market quantity exchanged would be  $Q_c$  at a price of  $P_c$  which would mean that the individual competitive supplier would sell  $q_c$  pelts. Alternatively, the situation could be improved without competition, i.e. without taking a chance on shifts in the curves, by setting a minimum price, ideally exactly at  $P_c$ . This would, however, be extremely difficult in practice, though it should be noted that any price set between  $P_m$  and  $P_c$  would improve the situation somewhat.

Considering that the cost of instituting any machinery for price control would considerably exceed the benefit accruing to any northern hunter or trapper and that even a very competent agency would find it almost impossible to determine  $P_c$  accurately, particularly in view of the irregular price fluctuations on the world fur market, and as furthermore any shifts in the supply curve that might occur as a result of introducing competition would be extremely unlikely to shift the intersection point of the new market supply and demand curves other than upward and to the right of the old point given by  $P_m$  and  $Q_m^x$ , the introduction of effective competition through the local co-operative is clearly indicated in the light of total local business volume.

# APPENDIX IV

## SUMMARY OF MARY RIVER WEATHER RECORDS

Month	<u>TEMPERATURE</u>				<u>PRECIPITATION</u>				<u>WIND</u>			
	<u>Daily Mean</u>	<u>Mean Max.</u>	<u>Mean Min.</u>	<u>Extremes Highest</u>	<u>Extremes Lowest</u>	<u>Total Rain</u>	<u>Total Snow</u>	<u>Total Water</u>	<u>Wind Most Prevalent</u>	<u>Average Vel.</u>	<u>Direction</u>	<u>Max. Winds</u>
March	-33.0	-24.0	-41.9	-14	-50	-	-	-	Calm	35	0	SE 25
April	- 8.6	0.4	-17.6	27	-41	-	14.0	1.40	SE	35	15	SE 40
May	13.7	21.8	5.5	34	-12	-	1.2	0.12	Calm	23	0	S 00
June	34.6	39.3	30.0	51	20	0.83	0.4	0.87	Calm	34	0	NE 40
July	43.9	50.2	37.6	65	31	1.72	T	1.72	SE	20	17	SE 30
August	44.7	51.0	38.4	63	30	1.58	T	1.58	SE	35	12	NW 50
September	33.2	37.3	29.1	49	- 8	1.89	1.8	2.07	N	20	16	NE 40
October	11.4	17.4	5.5	19	2	-	-	-	Calm	31	0	NE 25

- N.B. 1. Averages based on two years only: May 1 - August 25, 1963 and March 29 - October 7, 1964.  
 2. From September 14, 1963 to March 23, 1964 highest temperature was 34° and lowest was -58.  
 3. All temperatures given in degrees Fahrenheit.  
 4. Precipitation given in inches.  
 5. Winds given in statute miles per hour.

From: "Engineering Report #2 for Baffin Island Iron Mines Limited on the Mary River Iron Deposits by Watts, Griffis and McOuat Limited.











Errata: Northern Foxe Basin, Area Economic Survey Report.

- ✓ P. i - Insert at end of Preface: The opinions expressed in this report are those of the author and not necessarily those of the Department of Northern Affairs and National Resources.
- ✓ P. iii - Read: Figure 4 - Last ice in Fury and Hecla Strait - looking south.  
Figure 5 - Looking up Autridge Bay.
- ✓ P. iv - Read: Table VII - Capital Equipment - Igloolik Co-operative.
- ✓ P. 10 - Read: Figure No. 4: Last ice in Fury and Hecla Strait - looking south.  
Figure No. 5: Looking up Autridge Bay.
- ✓ P. 11, para 7, line 5 - Read "drift-covered."
- ✓ P. 16, para 2, line 2 - Read "...open, with Agu Bay..."
- ✓ P. 18, para 2, line 11 - Read "...while the Davis Strait Low..."
- ✓ P. 22, para 2, line 9 - Insert "along" after semicolon at end of line.
- ✓ P. 25, para 3, line 5 - Read "known" for "know".  
para 6, line 1 - Read "pregranitic"
- ✓ P. 30, para 3, line 5 - Read "polygons"
- ✓ P. 37, para 2, line 8 - Read "crossing"
- ✓ P. 46, para 3, line 8 - Read "should be made at least to restrict indiscriminate shooting to unattached males and"
- ✓ P. 47, para 4, line 4 - Read "Sarqaq"
- ✓ P. 53, para 1, line 11 - Insert "and the" after Aivilingmiut.
- ✓ P. 87, para 3, line 10 - Read "individual"
- ✓ P. 89 - Insert at bottom of page: "Photos courtesy Mr. W. Buske, owner of the carving."
- ✓ P. 103, para 1, line 2 - Read Lat. 71° 19' N.
- ✓ P. 106, para 3, line 5 - Read "loading facilities"
- ✓ P. 108, para 2, line 1 - Read "lightering"
- ✓ P. 111, para 2, line 4 - Read "Tindall"
- ✓ P. 120, Below Figure 37 insert - (Photograph courtesy Mr. K. Crow)
- ✓ P. 122, para 4, line 8 - Read "...in it should be carefully..."







E.M. 3-1-68



